LiveWell Kids
Garden and Nutrition Program

Lesson 5: Pollination & Seeds

This year's LiveWell Kids lessons are being delivered in adherence with the Los Angeles County Department of Public Health's Reopening Protocols for K-12 Schools.

LiveWell Kids Program Summary

The LiveWell Kids Garden and Nutrition programs have been combined to create a hybrid, farm-to-table program. The initiative is comprised of six interactive lessons which focus on educating K-5 students on the process and benefits of growing their own food and making healthy eating choices. All lessons are delivered in the fresh air of the school gardens by trained volunteers.

Objectives

By the end of this lesson, students will:

- Learn about the function of a plant's seeds
- Understand seed dispersal
- Dissect a flower and fruit and/or pod
- Identify what types of foods are seeds and why they are healthy to eat
- Learn about the role of pollinators
- Observe pollination in the school garden
- Gain a better understanding of the role of protein, fats & carbohydrates in the body
- Increase nutrition fact and food label knowledge

Volunteer Responsibilities

Three components:

1. *Before* the lesson
2. *Teaching* the lesson
3. *Post-lesson* reporting and cleanup

Supplies

****The following supplies are found in your shed:**

- 6 laminates:
  - *The Life Cycle of a Plant*
  - *Flower to Fruit Process*
  - *How Seeds Travel*
  - *Diagram of a Seed*
  - *Nutrition Facts: Carbohydrates* (Whole Wheat Pasta and Fruity Cereal)
  - *Nutrition Facts: Protein* (Black Beans and Hot Dog)
  - *Nutrition Facts: Fats* (Walnuts and Pecan Pie)
- 2 Cafeteria trays
- Knife
- Magnifying lenses
- Sanitizing wipes
- Optional: White board and dry erase markers

****For this lesson, we ask that you supply**:

- One or more flowers (a variety helps.) Here are some good examples: Morning Glory, Lily, Nasturtium.
- One or more pieces of fruit or pods (a variety helps.) Here are some good examples: lemon, tomato, milkweed pod.

Preparation

❖ One Week Before the Lesson

- Check in with your school's front office to ensure you and other participating volunteers are complying with all on-site volunteer requirements.
- Check with the teacher for any known allergies.
- Coordinate classroom supplies with the teacher, including paper and writing tools, if you're planning to do the "Reflection Page" of the activity.
- If using the "Did You Know?" page, print it out.
- Plan to provide samples for dissection (listed above: flower, fruit/pod.)
- Coordinate with co-volunteers.
  - Electronically send the lesson plan and communicate with your co-volunteers about your respective roles.
  - Be sure that you and your co-volunteers read the lesson plan before the day of the lesson.

❖ One Day Before the Lesson

- Gather your flower, fruit/pod for the lesson (refrigerate if needed.)

❖ Day of the Lesson

***Please allow 30 minutes for set-up and prep before the lesson. Request that your co-volunteers arrive early with you to help with the set-up. Besides the flower, fruit/pod, all supplies mentioned are found in the shed.*

- Set up the Introduction area with 2 laminates:
  - *The Life Cycle of a Plant*
  - *How Seeds Travel*
- Set up for Flower Activity:
  - Using the knife, cut a flower in half, right down the middle, and set it on a tray. Place any other flowers around it, uncut, if you have additional ones. Cut the fruit/pod in half and set it on the tray. Place the laminates (*Flower to Fruit Process* and *Anatomy of a Flower),* the box of magnifying lenses and sanitizing wipes next to the tray.
- Set up the Seed Activity:
  - Place the other half of the cut fruit/pod on a tray.
  - Place the *Diagram of a Seed* laminate next to the tray.
  - Set out 3 laminates:
    - *Nutrition Facts: Carbohydrates* (Whole Wheat Pasta and Fruity Cereal)
    - *Nutrition Facts: Protein* (Black Beans and Hot Dog)
    - *Nutrition Facts: Fats* (Walnuts and Pecan Pie)
- Optional: White board and dry erase markers could be a great teaching aid for any part of this lesson

Lesson 5: Pollination & Seeds

NOTE: You are not required to memorize a script to deliver the lesson. Throughout the lesson plan you will find "sample script" with suggested wording, but we encourage you to use your own words, so it feels more natural for you. Complexity of discussion is grade dependent. Since this is a dense lesson, please feel free to adjust the script based on the age group, flow and timing of your lesson.

INTRODUCTION AND MINDFUL BREATHING (2 MINUTES)

- Introduce yourself and other volunteers.
- Guide students through a mindful breathing exercise.
- Explain the purpose of this fifth lesson is to better understand the life cycle of plants and pollination, as well as gain a better understanding of how proteins, fats and carbohydrates work in our bodies.

Sample Script

Hi kids! My name is _____. Welcome to the fifth Beach Cities Health District LiveWell Kids lesson! Let's start with a mindful breathing exercise. You can close your eyes, or look down at the ground, and slowly take a deep breath in, pause for a moment, and then slowly let it out. Let's do it one more time,

deep breath in, pause, and slowly let it out. Now open your eyes. How do you feel?" (Allow a few students to respond).

What did you think about exploring the garden last time you were here? How many of you have thought of ways that you can help others since our last lesson?

Today, we're going to talk about the life cycle of plants and pollination, as well as gain a better understanding of how proteins, fats and carbohydrates work in our bodies.

SEED DISPERSAL (2 MINUTES)

Sample Script

All plants start out as a tiny seed (refer to The Life Cycle of a Plant *laminate.) Once the seed is planted in soil, given water, nutrients and sun, it grows roots and sprouts. It grows larger until it's ready to reproduce. Then it makes flowers which develop fruit or seed pods. Once the fruit/pod is mature, it releases the seeds to grow new plants, and the old plant dies. The plants that follow this cycle are called annual plants. There are plants that follow the same cycle, but don't die after they drop their seeds. These plants are called perennial plants.*

Continue with the following:

GRADE	INSTRUCTIONS
KINDERGARTEN & 1st Note: aligns with Common Core and Healthy Behavior Outcomes and Standards and Proposed California's Next Generation Science Standards (NGSS) for K-12	Sometimes plants drop their seeds and new plants grow right under the old plant. Other times, we find the new plants far away from the plant. Question: How did they get there? Answer: Sometimes people take the seeds and plant them where they want. If people don't plant the seeds, then nature has ways of moving them to a new spot, such as using the wind to blow them or animals to carry them.
2ND & 3rd GRADE Note: aligns with Common Core and Healthy Behavior Outcomes and Standards and Proposed California's Next Generation Science Standards (NGSS) for K-12 in Appendix A	Sometimes plants drop their seeds and new plants grow right under the old plant. Other times, we find the new plants far away from the plant. Question: How did they get there? Answer: (Allow for a few answers) That's right, we plant them OR birds and other animals eat the fruit of a plant and poop out the seed at a spot where it grows OR wind blows the seed, and it grows where it lands OR water washes the seed to a spot, and it grows there OR a seed attaches to a person or animal and gets carried to a new spot where it grows.

4TH & 5th GRADE Note: aligns with Common Core and Healthy Behavior Outcomes and Standards and Proposed California's Next Generation Science Standards (NGSS) for K-12	Sometimes plants drop their seeds and new plants grow right under the old plant. Other times, we find the new plants far away from the plant. Question: How did they get there? Answer: (Allow for a few answers) That's right, we plant them OR birds and other animals eat the fruit of a plant and poop out the seed at a spot where it grows OR wind blows the seed, and it grows where it lands OR water washes the seed to a spot, and it grows there OR a seed attaches to a person or animal and gets carried to a new spot where it grows. (Referring to the HOW SEEDS TRAVEL laminate) Look at these pictures. Some seeds have parachutes, or feathery structures to catch wind and sail through the air. Others have stickers that get them stuck in an animal's fur, or our clothing. Lots of seeds are surrounded by fruit, adapted to get eaten by animals. Some are designed to float in water. There are even some that explode open like a confetti popper, sending seeds scattering around the area.

POLLINATION (2 MINUTES)

Segue to the topic of *Pollination*.

Sample Script

So, you see, there are many ways that seeds end up where they do. This is called seed dispersal. This is how plants get spread around the world giving us a large variety of vegetation. Once the plant is ready to reproduce, it puts out flowers to get pollinated so that it can make its seeds.

Question: Ask what Pollination is and allow a couple of answers.
Answer: Moving pollen from an anther of a plant to the stigma of a plant so that it can make a seed.

Show *Anatomy of a Flower* laminate and point to orange section called 'anther filament' and show that the pollen needs to go from there to the 'stigma' which is the yellow section of the laminate.

Sample Script

Here's how it works: when a pollinator meets a flower, it's actually looking for nectar to drink, but it accidentally rubs against the powdery pollen, which sticks to its body. The pollen rubs off on the flower's stigma, (or the next flower's stigma) as the pollinator moves from flower to flower. We'll look at this more carefully during our flower activity.

Question: Ask what kind of living things can pollinate a plant and allow a couple of answers.
Answer: Most plants need 'pollinators,' such as bees, butterflies, hummingbirds, moths, even flies.

Sample Script

These are just some of the pollinators that help plants reproduce. Pollinators are responsible for pollinating between 80% and 90% of the plants in the world! They have a very important job because without them most plants wouldn't be able to make seeds – and seeds make new plants.

ACTIVITIES (10 MINUTES FOR EACH ACTIVITY / 20 MINUTES TOTAL)

Explain that they'll be dividing into two groups and participating in two different activities:

1. Seed Activity
2. Flower Activity

Split the class into two groups

Lead your group to their first activity. Send the other group with the co-volunteer/helper/teacher to the other activity. After ten minutes, have the groups switch activities.

Seed Activity (includes nutrition segment)

- Share the *Diagram of a Seed* laminate and point out the different parts of a seed to the class, pointing out the ***Radicle*** – the root, and the ***Epicotyl*** – the first leaves. Older students can discuss the other features listed if you feel you have time.
- Garden discussion will then shift to nutrition. Focus will be on three essential nutrients found in seeds that people also need: protein, fats and carbohydrates. In addition, you will help the students analyze Nutrition Facts food labels to determine the healthier source of these nutrients.
- Bring the *How Seeds Travel* laminate with you and have the kids gather around the Seed Activity station. Start by pointing out the seeds in the cut piece of fruit/pod.

Sample Script

Can you see how seeds are arranged in the fruit/pod before they are released? All seeds, whether in a fruit or a seed pod formed from a flower that was pollinated. When the fruit or pod is mature, it will release them so that they will make new plants.

Can anyone tell me some different ways that seeds travel? (Show them the How Seeds Travel laminate.) Seeds can travel around by people planting them, wind blowing them, water carrying them, sticking to animal fur or clothing, animals eating them and pooping them out, or dropping right off the plant and landing on the ground.

Transition seed discussion to nutrition segment. Follow talking points below.

Topic	**Essential Nutrients**
K-5th	Seeds have all the needed nutrients for a plant to grow healthy and strong. Think of it as a tiny package of nutrition. Seeds have vitamins and minerals, which we already learned about. They also have protein, a type of carbohydrate called fiber, and healthy fats. Protein, carbohydrates and fats are the three main nutrients in food. We need these nutrients to live.

	Eating a well-balanced diet with a variety of foods will give you enough of all the nutrients you need. You can use the Nutrition Facts food label to pick out foods with healthy carbohydrates, fats and protein. Show and explain the Nutrition Facts laminates when discussing the topics below: • *Nutrition Facts: Carbohydrates* (Whole Wheat Pasta and Fruity Cereal) • *Nutrition Facts: Protein* (Black Beans and Hot Dog) • *Nutrition Facts: Fats* (Walnuts and Pecan Pie)

Topic	**Protein** • Laminate - *Nutrition Facts: Protein* (Black Beans and Hot Dog)
K-5th	Protein is a nutrient that is found in plants and animals. Your body gets protein when you eat seeds, nuts, beans, eggs, lean meat, chicken and seafood. Eating protein can help build strong muscles, give you energy to play sports and help you focus in school. Protein also helps your body fight infection.
Additional option for 3rd-5th	Proteins are made up of microscopic amino acids. Think of them as building blocks, which they are often called. After you eat protein, the digestion process breaks this nutrient down into amino acids. The amino acids travel to different parts of your body, like the heart and brain, to keep them healthy.

Topic	**Fat** • Laminate - *Nutrition Facts: Fats* (Walnuts and Pecan Pie)
K-5th	Fat is used in your body to store energy. It is also used in your body as insulation to keep you warm, protect your organs, such as your kidneys and lungs, and carry some vitamins. Some fats are healthy, while other fats should be eaten less often. Healthy fats mostly come from plant sources, like nuts, seeds and fatty fruits like avocados and olives. Some fish, such as salmon, also have healthy fat. Fat is also in meat and many highly processed foods. It's best to get fat from plant-based products whenever possible.
Additional for 3rd-5th	Certain kinds of fats can be unhealthy when eaten in large amounts, such as *saturated fats* and *trans fats*. These types of fat can be found in higher-fat meats and dairy, and some processed foods such as cakes, cookies and snack foods. *Unsaturated fats* are often called healthy fats because they help reduce heart disease and lower cholesterol levels. There are two types of unsaturated fats, polyunsaturated and monounsaturated. • *Monounsaturated fats* are found in olive oil, canola oil, avocados and nuts. • *Polyunsaturated fats* are found in some nuts, seeds, oils, fish and eggs.

Topic	**Carbohydrates** • Laminate: *Nutrition Facts: Carbohydrates* (Whole Wheat Pasta and Fruity Cereal)
K-5th	Our bodies need carbohydrates for energy. Protein and fat can't do their jobs unless we have enough carbohydrates. It's especially important for you, as children, to get enough carbohydrates for energy because you are very active, still growing and developing. Healthy sources of carbohydrates include different vegetables and fruits, as well as whole grain products like wheat bread, brown rice, quinoa and oats. Sugars like corn syrup, maple syrup and cane sugar are also carbohydrates, but it's best not to eat too much of them. These types of sugars are in many processed foods, such as soda, candy and other sweet treats. Sugar is also in ketchup and added to some yogurts and breads. Some foods with carbohydrates have fiber. *Fiber* is found in many foods that come from plants, including fruits, vegetables, nuts, seeds, beans and whole grains. Your body cannot digest fiber, so it passes through your body and helps to move all the other food and nutrients along with it. This is very good because it helps prevent many illnesses. Therefore, try to get most of your carbohydrates from fruits, vegetables, fat-free and low-fat dairy and whole grains instead of added sugars and refined grains.
Additional for 3rd-5th	There are two types of carbohydrates: • **Simple carbohydrates** are also called simple sugars. An example is the white sugar you pour into a bowl, or that you may have seen used for baking. Candy, like lollipops, have simple carbohydrates, but so do some nutritious foods, like whole fruit. It's healthier to get your simple sugars from fruit than candy because the sugar in fruit is natural, meaning it is part of the fruit and not added, like it is in candy. Plus, fruit has other nutrients, such as vitamins, minerals and fiber. • **Complex carbohydrates** are also called starches. Through digestion, your body breaks down complex carbohydrates into simple sugars. Complex carbohydrates give you energy over a longer period of time because it takes longer for your body to break them down due to the high fiber content. Some complex carbohydrate foods are better choices than others. Although white flour/bread and white rice are complex carbohydrates, they have been processed so their nutrients and fiber have been removed. Whenever possible, choose grains in their whole form so you get fiber, vitamins and other nutrients.

Switch Stations

Flower Activity

- Tell the students that they're going to look at the different parts of a flower to understand how pollinators move the pollen to the stigma to make seeds, as well as see where seeds are formed.
- Bring the Anatomy of a Flower laminate with you. Have the kids gather around the Flower Activity area. Start by showing the kids the *Anatomy of a Flower* laminate.

Referring to the laminate, point out: Anther, Stigma and Ovary. Ask if they can see that the anthers are on the ends of long wire-like structures. These are called ***Filaments***.

Question: Ask if anyone know what the word 'filament' means?
Answer: It's a 'thread-like' structure. Together the anther and filament make up the ***Stamen***.

Sample Script:

Now we're going to look at a cut flower to see the structures that we just talked about in the picture. We'll have to take turns looking because now that's it's been cut open, it's very fragile, so we won't be lifting it off the tray. (If you have more than one flower, then you can mention that they'll also be looking at some uncut flowers that they can handle. Without lifting the cut flower off the tray, have a few kids at a time look at them.)

Ask if anyone can identify the parts that they saw on the laminate and allow for a few answers. If you have other flowers that are not cut, have them gently handle them and peek inside, to look for the structures on the laminate. Ask if they can see the same structures.

Using the laminate, point out the ***Anthers.*** Explain that the pollinator rubs against the anthers, getting covered in pollen. Then point out the ***Pistil***. The pollinator accidentally rubs the pollen onto the pistil as it moves around the flower, pollinating the plant. Have them find these on the real flowers.

GRADE	TALKING POINTS
KINDERGARTEN - 3rd GRADE Note: aligns with Common Core and Healthy Behavior Outcomes and Standards and Proposed California's Next Generation Science Standards (NGSS) for K-12	(Using the ANATOMY OF A FLOWER laminate): Look closely at the little bump right here called the OVULE. This is going to become one or more seeds after the pollen travels down this tube (point to the 'style') to reach it. See if you can recognize it in the cut flower.
4TH & 5th GRADE Note: aligns with Proposed California's Next Generation Science	(Using the ANATOMY OF A FLOWER laminate): Look closely at the stigma in this picture. Do you see that it is just the tip of a tube-like structure? When the pollen lands on the stigma, it travels down inside the tube, called the STYLE until it ends up inside the OVARY. Together, the stigma,

Standards (NGSS) for K-12 in Appendix A	style and ovary make up the PISTIL. Inside the ovary is the OVULE, or the seed eggs, which are waiting to combine with the pollen. Once they combine, the ovule develops into a seed. See if you can recognize these parts in the cut flower.

Show the *Flower to Fruit Process* laminate.

Sample Script

Now look at this piece of fruit that's cut in half. We can see the ovary and ovum have grown into the fruit and seeds. (Point out the corresponding structures in the laminate and see if they can identify them in the fruit.)

OBSERVING POLLINATION (4 MINUTES)

Gather the class all together and explain how to be safe around pollinators.

Sample Script

Now that we are going to be up close to some insects that can sting, it is very important that you observe with just your eyes, not touching any of the pollinators. If a stinging pollinator comes near you, be still, or step away slowly and calmly, don't wave your arms around, as this scares them and gives them a reason to sting! Are there any questions about this?

- Tell the students that they're now going to walk through the garden and see if they can mindfully observe pollination in action. Since they are going to get up close to insects, they need to move slowly and quietly.
- Once they see one that they want to watch, be still, and don't get too close. They can watch closely to see if they can observe the insect drinking nectar, getting covered in pollen, and moving from flower to flower.
- When an insect lands on a flower, have them try to see if it rubbed against the stigma. This is an activity that they are going to do ALONE. Since they are 'observing,' they'll be paying attention and not talking, so it should be very quiet.
- Have them pay attention to the sounds that the pollinators make; some are noisy, and some are silent.
- Also, have them notice if the flowers they found with a pollinator have a strong smell or not.

If there are no pollinators, discuss different types of pollinators such as butterflies, bees, hummingbirds and wasps and how they pollinate flowers. Ask them to be mindful when they are outside to see if they can spot them in the future.

CLOSING THE LESSON (1 MINUTE)

Gather the class all together and recap some of the key points of the lesson.

Sample Script

Raise your hand if you want to share what you observed? (Allow several students to share, listening for descriptions about sound, sight and smell). Wonderful! Seeing that we have a lot growing here, we now know that the pollinators in this garden have been very, very busy! Each and every vegetable and piece of fruit was pollinated, or it wouldn't be here. Next time you see a bee or a butterfly around a flower, remember the very important job that they are doing!

Also remember to do the best you can when choosing the foods that you eat each day. We all need healthy protein, fat and carbohydrates for our bodies to work well!

Thank you all for being so respectful in the garden today. (Thank the teacher and parent helper.) I'll see you next time when we plant your warm season crops.

POST-LESSON TASKS

If students created 'Reflection Pages', take a few photos to share with us via email (students can keep the original):
Mishell.Balzer@bchd.org or Tami.Kachel@bchd.org

- Clean up and put all supplies away in the shed.
- Report your lesson as delivered with the online form:
  https://publish.smartsheet.com/86d1bf6fe32b40daa08d15a2879bd2a4
  or scan the QR code on the inside of the shed door.
- Return the shed key to the front office.

EDUCATION STANDARDS:

LiveWell Kids applies California Health Education and Common Core standards in each lesson. For more information, please visit our website at https://www.bchd.org/LiveWellKids .

Resources:
https://www.makemegenius.com/factlist1.php http://www.telegraph.co.uk/men/the-filter/qi/8180000/QI-Quite-interesting-facts-about-seeds.html
http://homeguides.sfgate.com/self-pollinating-vegetable-plants-42482.html
http://theseedsite.co.uk/lifecycle.html
http://corporate.britannica.com/termsofuse.html
http://www.cde.ca.gov/pd/ca/sc/ngssstandards.asp http://www.education.com/worksheets
https://www.nia.nih.gov/health/important-nutrients-know-proteins-carbohydrates-and-fats
http://www.uc.edu/cdc/urban_database/food_resources/NUTRITION-LESSON-2-NUTRIENT0&FOOD-LABEL-FACTS.htm
https://www.scienceworld.ca/resource/plants-we-eat/
https://kidshealth.org/en/parents/sugar.html
https://www.ducksters.com/science/biology/proteins_and_amino_acids.php
Rath, N. (2021). *Unit 2: Plant Reproduction & Response*. *https://nickrath.weebly.com/*. East Greenwich; Rhode Island

DID YOU KNOW? FUN FACTS

- Do you know that an average strawberry has about 200 seeds. And it is the only fruit that bears its seeds on the outside.
- Petals are usually colorful, and they attract insects and birds that help with pollination.
- One dandelion flower head produces 200 seeds and can travel more than a half mile!
- Hot weather is better than windy weather for seed dispersal as it generates updrafts, allowing seeds to rise higher and travel further.
- If a flower doesn't get pollinated, it dries up and falls off the plant without producing seeds.
- Some plants have both male and female flowers while others have both male and female parts inside the same flower.
- Corn, lettuce, beans and tomatoes don't need pollinators because they are SELF-POLLINATING.
- Pollinators visit flowers to get a reward like nectar or pollen, unaware that they are pollinating the plant.
- Flowers are designed to appeal to their specific pollinators by using a color and scent that might not be attractive to other pollinators.
- About 20% of our body is made up of protein.
- Every single cell in the human body contains protein.
- Simple carbohydrates can cause a quick rise in blood sugar, while complex carbohydrates contain fiber, which slows the digestion of sugars and does not spike blood sugar.