



# HARVEST LESSONS

THIS MONTH'S THEME:

## K A L E

*Lesson Plan*



HARVEST LESSONS ARE A FUN WAY FOR K-4 CLASSROOMS TO EXPLORE, TASTE AND LEARN ABOUT EATING MORE FRUITS AND VEGETABLES EVERY DAY.

## ACTIVITY SUMMARY

ACTIVITY	GRADE LEVEL	CURRICULUM CONNECTION	TIME
Intro	all	<b>Literacy:</b> speaking, listening <b>Science, Social Studies:</b> evaluating claims to determine whether they are true	10 min.
Taste Test	all	<b>Literacy:</b> speaking, listening <b>Math:</b> measurement, graphing/tallying responses	20 min.
#1: Observe, Draw & Discuss Kale	all	<b>Science:</b> classification, observation	30 min.
#2: Read Kale Literature	all	<b>Literacy:</b> listening comprehension	20 min.
#3: Make Massaged Kale Salad	all	<b>Math:</b> measurement <b>Science:</b> observation <b>Literacy:</b> reading comprehension	30 min.
#4: Create a Kale Timeline	3-4	<b>Social Studies:</b> geography, past and present	15 min.
#5: Map Kale's History	3-4	<b>Social Studies:</b> history, geography	20 min.
#6: Discuss Season Extension	all	<b>Science:</b> weather, adaptations, structure and function of organisms, measurement of temperature	10 min.
Background Information on Nutrition	NA	This helpful information can aid volunteers as they prepare to speak about kale and greens in the classroom	NA



## INTRODUCTION

ALL GRADES

Introduce yourself, or reintroduce yourself to the class, and introduce the vegetable of the day. Begin with a fun interactive true or false activity. When a statement is true, students will stand up. When they believe a statement is false, they will sit down.

### TRUE OR FALSE?

**1. Kale is related to the cabbage plant.**

True. Kale is in the same plant family as cabbage, broccoli, and cauliflower.

**2. There are up to 12 different kinds of kale.**

False. There are more than 50 varieties, and they come in different shapes and textures from purple to green. Names include dinosaur Kale, and Russian Kale, and cow kale.

**3. You may not have heard of Kale because it is a new vegetable and it is only now getting popular.**

False. Kale is more and more popular and found on more menus and in more homes these days, but it is not a new food! Kale has been cultivated (grown) for over 2000 years and was a popular dish in ancient Rome, and was eaten in a more wild form for much longer.

**4. Kale is high in Vitamin K, which helps our blood and our bones.**

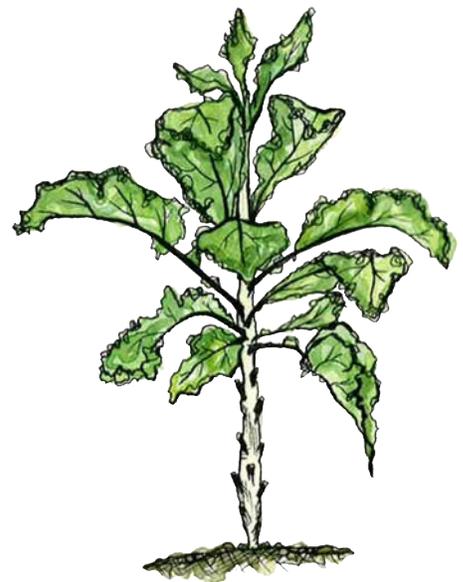
True. It should be easy to remember because Kale starts with K!

**5. Kale can be harvested in the December in New England.**

True. Kale is a hardy plant, and the waxy layer on the outside of the leaves called the epidermis allows it to grow into the colder months of fall and winter. With a greenhouse or cold frame, kale can be grown even longer!

### TASTE TEST

Consider doing a comparison of raw vs. steamed kale, or kale chips for a taste test. See the Vermont Harvest of the Month resources for more recipe ideas, or for a cooking activity to do with kids, see our "Massaged Kale salad" later in this Harvest Lesson!





## ACTIVITY #1 (30 MINUTES)

ALL GRADES

### OBSERVE, DRAW & DISCUSS KALE

Students will watch a [five-minute video](#) of a farmer introducing broccoli, cauliflower, and the brassica family.

#### MATERIALS:

- Kale, and other leaves if possible such as spinach and chard for observation
- Magnifying glasses
- Paper or journals
- Colored pencils

**Optional:** images showing the common patterns in trees, veins, lungs, roots, rivers.

**PREPARATION:** Gather materials. Print or find & test a way to project images.

**PROCEDURE:** Write the focus question on the board: "What's in a leaf?" Pass out a kale leaf to each student or pair of students, and ask students to look carefully at their leaves.

All kids should draw what they see. Direct them to label their drawing with any parts that they know of. After students have had some time to observe and draw independently, and do some labeling, bring them together and have them add more labels to their drawing/diagram. It may be helpful to model drawing step by step on the board or if appropriate, display a diagram on the smartboard. As you talk about the parts you can see, discuss their functions, or "jobs."

Here are some suggestions for what to discuss with each age group, and explanations of what each part does for the plant in the section **Parts of the Leaf We Can See & Their Jobs**.

**KINDERGARTEN:** Draw pictures of leaves, or trace leaves. Some may give their drawing a title - "Kale," or "Kale Leaf."

**GRADES 1-2:** Title their drawing, and draw and label these parts of the leaf:

- Blade
- Stem
- Veins

**GRADES 3-4:** Title their drawing, and draw and label the:

- Blade/Lamina
- Stem
- Petiole
- Veins
- Epidermis



*(activity #1 continued)*

## PARTS OF THE LEAF WE CAN SEE

**BLADE:** The main part of the leaf; all of it except the stem, veins and petiole. The blade of the leaf takes in sunlight and turns it into food. It is also where the plant “breathes.”

**LAMINA:** Scientific word for blade of a leaf.

**STEM:** The stem supports the leaf (like our skeleton supports us, and our legs), and, like the veins, transports (or moves) water, minerals and food energy.

**PETIOLE:** The stalk of the leaf, which attaches to the stem of the plant. Its job is to hold the leaf to the rest of the plant.

**VEINS:** AKA vascular bundle. The veins’ job is to transport (move) water, minerals and food energy through the leaf and on to the rest of the plant. The veins in a leaf do the same things that the veins in our bodies do!

**EPIDERMIS:** The outer protective layer of a leaf. Epidermis is a fancy word for skin. We have an epidermis too - our skin! Sometimes the leaf may be waxy because the epidermis secretes a waxy protective cuticle. This waxy covering protects the leaf, and in the case of Kale, is a reason it is cold hardy.

When discussing the veins, you might take some time to prompt students to **compare the way veins look and function to other structures in nature**. Ask students to look at the veins in their drawing of the kale leaf, or at the veins of the actual leaf. Then ask, “Do we see these patterns anywhere else in nature?” Guide the conversation to trees, and veins in human bodies. Provide illustrations to demonstrate the similar fractal patterns in plant and animal organisms, and in rivers. These can be displayed on a smart board if the classroom has one, drawn on the board or you may print images to share.

Ask students to think about and guess why these things might look similar. Some theories they might come up with include the fact that these structures (veins in humans, veins in plants, streams flowing into rivers) do similar things, and/or that their shape is perhaps the most efficient. This is just an interesting conversation and thinking exercise, there is no set conclusion or fact that students should come to.

After discussing the parts of a leaf that we can see, and what each part does, then ask and discuss “What’s in a leaf that we can’t see?” Below are some suggestions for what to discuss with each age group, and explanations of each topic in the section **What’s In a Leaf That We Can’t See**.

### *Discussion Topics*

**KINDERGARTENERS:** nutrients & vitamins

**GRADES 1–2:** nutrients, vitamins & minerals; photosynthesis

**GRADES 3–4:** nutrients, vitamins & minerals; photosynthesis; chlorophyll



*(activity #1 continued)*

## PARTS OF A LEAF WE CAN'T SEE

**NUTRIENTS:** Nutrients are the parts of food that give us energy. Explain that leaves can be considered the food factories for a plant. Things inside the leaf that we can't see convert energy from the sun into energy, or nutrients, that plants can use, and that we can use when we eat plants!

**VITAMINS:** The vitamins found in green leafy vegetables support our skin, help our immune system block sickness, help our body and our brain. Vitamins found in leafy greens: A, B, C, E, and K.

**MINERALS:** The minerals found in leafy greens help our bones, heart and nervous system. They also keep us from getting sick. Minerals found in leafy greens: Calcium, Sulphur, Magnesium

**PHOTOSYNTHESIS:** The process in leaves converting light energy to food for the plant. Carbon dioxide and water are used in photosynthesis and oxygen is released. We cannot see that photosynthesis happening. It is important because without it, we wouldn't get any energy from eating plants! And, the oxygen that is made

**CHLOROPHYLL:** Leaves are the part of the plant richest in chlorophyll, which makes them green. So we actually CAN see chlorophyll. Chlorophyll is used in the process of photosynthesis. Chlorophyll supports our body in making blood, and our liver in getting rid of bad stuff in our blood (toxins) when we eat it.

### Closing

Close this activity by having students write on their diagram, or in a journal/science notebook about what is in a leaf. Ask, "What are the things in a leaf that we can see, and what are the things we cannot see?" On their journal page, students may write letters of the vitamins (**for grades K-1**), key vocabulary words (**grades 1-2**), or full sentences (**grades 3-4**) answering this question.

## ACTIVITY #2 (20 MINUTES)

ALL GRADES

### READ KALE LITERATURE

Read ***Captain Kale and the Super Foods*** by Amy Roth. This illustrated book tells the story of a battle between the junk food and healthy food in the pantry of one little boy, and teaches the importance of eating whole foods for our health.

See the introductory chapter for information and ideas on how to engage students in reading about healthy foods.



## ACTIVITY #3 (30 MINUTES)

ALL GRADES

### MAKE MASSAGED KALE SALAD

To segway from observing kale leaves into this activity, tell students, "Next we are going to make a recipe using kale, and when we eat kale, our own veins will send these important nutrients to our bodies!"

#### MATERIALS:

Small bowl to mix dressing  
 Measuring cup  
 Measuring spoons  
 Lemon juicer  
 Mixing spoon  
 Individual bowls/plates for each child  
 Knife and cutting board to cut apples

#### PREPARATION:

Be sure to gather all ingredients, and tools and clear a workspace. Make sure all students wash their hands before the cooking activity.

### MASSAGED KALE SALAD

#### INGREDIENTS

2 bunches kale – one leaf per child  
 2 lemons  
 ½ cup extra virgin olive oil  
 Kosher salt  
 2 Tbsp honey  
 2 Tbsp apple cider vinegar  
 1 apple  
 ¼ cup toasted pepitas (pumpkin seeds) or toasted sunflower seeds

#### DIRECTIONS

Each child have their own small bowl and kale leaf. They will tear the leaves from the stem, and tear into small pieces. They may roll the kale in their hands and place in a small bowl. As they "massage" their kale, have them note the waxy texture of the leaves and note that they are breaking down the epidermis, the waxy protective outer layer.

While children are occupied massaging their greens, you may invite kids to help with salad dressing, or you may save time and make it yourself, showing the class what is in it as they massage their greens. If you want to include kids, there may not be enough jobs for everyone, but you can ask children questions related to what we just discussed, and the children who raise their hand nicely with the correct answer may come up and add ingredients.



*(activity #3 continued)*

### **DIRECTIONS** *(continued)*

To make the dressing, mix in medium bowl: juice of two lemons (can be four jobs to squeeze them), olive oil, honey, apple cider vinegar and salt to taste.

When children have massaged their leaves thoroughly, they may be added to a plate, and adults will dole out dressing, and apple slices (can be sliced by an adult) and a small scoop of seeds.

### *Discussion Questions*

What is found in greens that makes food for the plant?

What is a mineral found in greens that is also found in milk?

What do we have in common with plants?

What do we call the lines in leaves that carry food?

What makes leaves green and also makes food for plants?

*Remember to submit your taste test results on our website!*

## ACTIVITY #4 (15 MINUTES)

GRADES 3-4

### CREATE A KALE TIMELINE

#### **MATERIALS & PREPARATION:**

Print out and cut apart the Kale History Facts (see appendix). Also keep a copy of the facts for yourself as a key. Mix them up and place in a bag, hat or basket. You may want to glue each fact to an index card to make them easier to shuffle and more durable. Or, you could laminate them.

#### **PROCEDURE:**

Give one fact about the history of kale to groups of 2 or 3 students. Have students read the fact to/with their group members. Then, have them share out their fact to the whole group. Ask the class to figure out which order the facts go in, and have them stand with their fact & team in a human timeline to show the order they believe is correct. Let students lead the discussion as much as possible, but be prepared to facilitate - this may be a difficult task for some classes, both in terms of the academic skills and the social skills (working as a team).



## ACTIVITY #5 (20 MINUTES)

GRADES 3-4

### MAP THE HISTORY OF KALE

#### MATERIALS:

A copy for each student of Harvest Lessons map (see appendix). Also, one copy of the Kale Timeline & Mapping Directions to project, or one copy per student. Plus, an atlas for each student or pair of students. Colored pencils.

#### PREPARATION:

Gather materials. This activity pairs well with Activity #4: Creating a Kale Timeline, so you could conduct that activity before or after this one.

#### PROCEDURE:

Pass out copies of the Harvest Lessons map to each student. Project or pass out the Kale Timeline & Mapping Directions. Instruct students to follow the directions to map the history of kale!

#### DIRECTIONS

It's hard to say how long people have been eating kale, but we know that it was cultivated from a wild cabbage plant, and it has been cultivated for over 2000 years, and people have been eating it in its more wild form for much longer.

Kale was a popular dish in Ancient Greece and Rome. The Roman Empire spread as far as Northern Africa, and the British Isles.

**#1: Color Greece & Italy, which were the heart of the Roman Empire, green.**

Kale was a common dish into the Middle Ages in Europe, when headed cabbage became more popular.

**#2: Draw a blue line around Europe.**

In the Scottish Isles, Kale was such a popular dish because it can grow in cold northern climates. It was so common that kitchen gardens were called Kaleyards! People would store it with salt over the winter, and even feed it to their animals.

**#3: Color Scotland purple.**

Kale was introduced to North America in the 1700's.

**#4: Label North America and color it orange.**

*See appendix for world map worksheet.*



## ACTIVITY #6 (10 MINUTES)

ALL GRADES

### DISCUSS SEASON EXTENSION

If you are conducting this lesson on kale in the cooler winter months when leaves are off the trees, begin with this prompt: **“Today we are going to talk about leaves. Are there leaves on the trees now?”** No, the leaves have all left for the winter, but are there leaves that we can eat now? There are some ways that we can still eat leaves in the winter, if we have greenhouses, and there are some greens which are “hardy”, and survive in the cold.

Greenhouses and cold frames are ways that we can extend the growing season. Hardy greens such as kale and collards, and other members of the brassica family, can be grown outside after a frost. Though they may only grow a tiny bit, they will stay alive through the snow, and even get sweeter after the first frost when their sugar content increases.

**Does your school have a greenhouse or cold frame?** Consider planting hardy greens, or visiting a local farm where you can see greens growing into the winter months. **See the Spring Greens Harvest Lesson plan for instructions on making “mini-greenhouses.”**

### BACKGROUND INFORMATION ON NUTRITION OF LEAFY GREENS

Leafy greens are packed with vital vitamins and minerals to support our bodies functioning. here’s some great background information to help you prepare for your lesson:

**CALCIUM:** Important in the formation of bones, the heart and nervous system.

**SULPHUR:** Helps protect our body from infection, blocks pollutions, and slows down aging.

**MAGNESIUM:** Essential for enzyme activity, nerve transmission, bone formation and metabolism of carbohydrates and minerals.

**VITAMIN A:** Helps keep skin smooth and healthy, and protects against colds, flus and infections.

**VITAMIN B:** Has many forms, and maintaining health of nerves, skin, eyes, hair, liver, mouth, muscle tone, brain function. It can help with weakness, irritability and depression.

**VITAMIN C:** Helps resist infection, strengthen blood vessels, gives us energy, and keeps bones and tissue healthy.

**VITAMIN E:** Protects against disease, and helps keep skin and hair healthy.

**VITAMIN K:** Important in blood clotting, and bone function and repair.

**Note:** Now that we can break down the vitamins into different letters and functions, and buy supplements for each, there is a tendency to do so. The important take-away is not what each vitamin does, but that leaves contain ALL these important nutrients, and add to the better functioning of our whole body. Though they do not contain everything we need, color can indicate different nutritional content, and we stress eating the rainbow to make sure we get everything that we need to be strong and healthy!



## CLOSINGS

### ACKNOWLEDGEMENTS

**The following people contributed to developing this lesson plan:** Chloe Powell, Aurora Coon, Cat Buxton and Karen Ganey.

### Resources used to develop this lesson plan include:

- GFL 2009 RESOURCE Guide, Foodworks at Two Rivers Center, Montpelier VT
- Enchanted Learning.com: [www.enchantedlearning.com/subjects/plants/leaf/](http://www.enchantedlearning.com/subjects/plants/leaf/)
- Whole Foods Cookbook: [www.tried-and-true.com/new/edibles/kale/](http://www.tried-and-true.com/new/edibles/kale/)
- Recipe adapted from [foodnetwork.com](http://foodnetwork.com).
- Additional kale recipes from Cedar Circle Farm and Education Center.
- Online resources:
  - [www.nytimes.com/2013/10/20/magazine/who-made-that-kale.html](http://www.nytimes.com/2013/10/20/magazine/who-made-that-kale.html)
  - [www.veraveg.org/Veg%20History/Veg%20History%20Kale.html](http://www.veraveg.org/Veg%20History/Veg%20History%20Kale.html)
  - [www.whfoods.com/genpage.php?tname=foodspice&dbid=38](http://www.whfoods.com/genpage.php?tname=foodspice&dbid=38)

## APPENDIX SEE WORKSHEETS THAT FOLLOW

## KALE HISTORY FACTS *(for activity #4)*

IT'S HARD TO SAY HOW LONG PEOPLE HAVE BEEN EATING KALE, BUT WE KNOW THAT IT WAS CULTIVATED FROM A WILD CABBAGE PLANT, AND IT HAS BEEN CULTIVATED FOR OVER 2000 YEARS, AND PEOPLE HAVE BEEN EATING IT IN ITS MORE WILD FORM FOR MUCH LONGER.

KALE WAS A POPULAR DISH IN ANCIENT GREECE AND ROME.

KALE WAS A COMMON DISH INTO THE MIDDLE AGES IN EUROPE, UNTIL AROUND THE 1200S, WHEN HEADED CABBAGE BECAME MORE POPULAR.

IN THE SCOTTISH ISLES, KALE WAS SUCH A POPULAR DISH BECAUSE IT CAN GROW IN COLD NORTHERN CLIMATES. IT WAS SO COMMON IN THE MIDDLE AGES THAT KITCHEN GARDENS WERE CALLED KALEYARDS! PEOPLE WOULD STORE IT WITH SALT OVER THE WINTER, AND EVEN FEED IT TO THEIR ANIMALS.

KALE WAS INTRODUCED TO NORTH AMERICA IN THE 1700'S

THOMAS JEFFERSON WHO WAS AN AVID GARDENER, AND GREW SEVERAL VARIETIES OF KALE IN THE EARLY 1800'S.

IN THE 1940S, DURING WORLD WAR II, BRITAIN ENCOURAGED PEOPLE TO GROW KALE IN THEIR GARDENS FOR ITS "DIG FOR VICTORY" GARDENING CAMPAIGN.

TODAY KALE CAN BE FOUND ON THE MENUS AROUND THE WORLD, AND IN SCHOOL CAFETERIAS.

# THIS MONTH'S FOOD:

