WASHINGTON STATE UNIVERSITY
KING COUNTY EXTENSION

Outline of Lesson
Growing with Stems
Unit 1, Lesson 5
Grade 1-3

Lesson Time: **60 Minutes**

Lesson Outline:

1. **Healthy Meal: Vegetables**
   - Learning about the vegetable group on the healthy meal tray

2. **Function of Stems and Bones**
   - Stems support a plant as bones support our bodies

3. **Healthy Meal: Calcium**
   - Importance of bone health, and foods that are good sources of Calcium

4. **Planting a Leaf Garden**

5. **Healthy Snack: Celery**

Student Learning Objectives:

By the end of this lesson students will:

- Know that they should eat at least 3 Cups of fruits and vegetables each day.
- Understand the functions of plant stems.
- Understand the role of Calcium in good health, and sources of Calcium.

References:

- Kite, L.P. Gardening Wizardry for Kids. Barron's Educational Series. 1995. P.75-77.
- Jaffe, Roberta and Appel, Gary. The Growing Classroom. Life Lab, 1990. P240-242.
- Weaver CM, Proulx WR, Heaney R. *Choices for achieving adequate dietary Calcium with a vegetarian diet.* Am J Clin Nutr 1999; 70(suppl):543-8s

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Overview (for Teacher)

Pre-Class Preparation	Collect six 1-gallon jugs (milk jugs) and remove tops.
Teacher Involvement During Class 	• Assist with the planting activity. • Assist in behavior management of students.
Post-Class Teacher Responsibilities	**Stem Snack: Celery** • Make overhead of food label. • Look at the food label and answer questions as a class. • Have students wash hands or serve snack after the students have already washed their hands. • Hand out stem snack to students (one piece per student).
Vocabulary	**To sprout–** when a seed gets moist and begins to grow into a plant, its roots and stem come out of the seed (sprout = germinate). **Stem–** the part of the plant that holds up the plant. The leaves, flowers and fruit are attached to the stem. **To support–** to help someone or something by holding it up. **Calcium–** a mineral found in vegetables and dairy products and which helps bones and teeth grow strong and healthy.
Critical Thinking Activity	None
Supplementary Activities	Student Assessment
Web Resources	• 5-A-Day fruits and vegetables: www.5aday.com/html/educators/insights.php • Calcium requirements for kids: www.spine-health.com/topics/conserv/calcium/calcium01.html
Suggested Books for Reading in the Classroom	None

EALR & GLE Alignment

EALR	GLE	Lesson Applications
Science 1.2 Understand how components, structures, organizations, and interconnections describe systems 1.3 Understand how interactions within and among systems cause changes in matter and energy	1.2.1 Understand that things are made of parts that go together 1.3.8 Understand that living things need constant energy and matter	• Function of Stems and Bones • Planting a Leaf Garden
Health and Fitness 1.4 Understand the relationship of nutrition and food nutrients to physical performance and body composition 2.1 Recognize patterns of growth and development 3.3 Use social skills to promote health and safety in a variety of situations	1.4.1 Identify the nutrients provided by a variety of foods and describe how bodily functions and physical performance are affected by food consumption 2.1.1 Describe the influence of nutrition on health and development 3.3.1 Express emotions constructively and form safe and respectful relationships	• Healthy Meal: Vegetables • Healthy Meal: Calcium • Function of Stems and Bones • Planting a Leaf Garden
Communication 1.1 Focus attention 1.2 Listen and observe to gain and interpret information 3.1 Use language to interact responsibly and effectively with others 3.2 Work cooperatively as a member of a group	*GLE not available at this time	The following apply to all Communication EALRs: • Function of Stems and Bones • Planting a Leaf Garden (in teams)
Writing 2.2 Write for different purposes, such as telling stories, presenting analytical responses, etc.	*GLE not available at this time	• Student Assessment

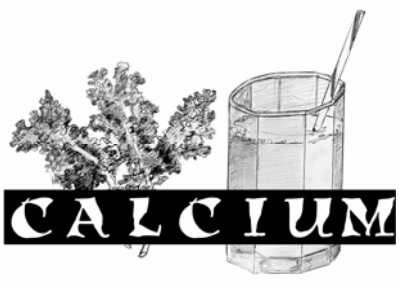
Preparation Outline

Activity Supplies ⊗ *Items marked with this symbol may not be purchased using FSNE funding, nor included as part of cost share*	**Healthy Meal: Vegetables** • Plastic lunch room tray • Food models from vegetable group • 1 food model from the meat and beans group • Green colored vegetable group label **Introduction** • 4-5 samples of vegetables that are stems: celery stalk, chard, rhubarb, bok choy, fennel, asparagus • Plant Part Poster **Function of stems** • 1 rib of celery • 2 clear plastic cups • Water • Red food coloring **Chicken Bone experiment** • 1 chicken bone soaked in cola (make sure phosphoric acid is an ingredient in the cola) for 1-2 weeks • 1 chicken bone soaked in milk for 1-2 weeks **Healthy Meal: Calcium** • Plastic lunch room tray • Food models from milk group • 1 food model from the meat and bean group • 1 food model from the vegetable group • Blue colored milk food group label **Indoor garden** ⊗ 6- 1 gallon jugs ⊗ Soil ⊗ Popsicle sticks ⊗ Watering can ⊗ Variety of lettuce seeds ⊗ Small paper cups labeled with seed names (it is easier for small fingers to grab seeds from a paper cup instead of a seed packet) **Healthy Snack** • 2 inch pieces of celery (1 per student) **Review** • Plant part pictures of stems. • Plant Part Poster • Classroom Tasting Challenge checklist
Overheads	None
Student Handouts	None

Teacher Handouts	• Bok choy Food Label • Student Assessment and Answer Key
Changes for K and ELL Classes	Demonstrate planting jobs in front of class, then walk through each job with the teams. Have students do each job together with you as you model it.
Rainy Day Activity Supplies	None

Outline	Content
Healthy Meal: Vegetables (5 Min)	**Healthy Meal: Vegetables** • Put the green colored vegetable food group label on the board. Ask if anyone can name some foods from the vegetable group? List suggestions on the board under the label. • Hold up Healthy Meal tray (should be empty except for protein). Where does the Carrot Jicama Salad go on our Healthy Meal? (vegetable group). Place the vegetable food model on the tray. **Serving Sizes** • You need to eat at least **3 Cups** of fruits and vegetables a day to stay healthy. (1 serving equals ½ cup.) **Nutrition Information** • Explain that our recipe has a lot of Vitamin A, Vitamin C, and Fiber (have them point to each body part as you say each nutrient). The vegetable and fruit groups are highest in these important nutrients.
Introduction and Lesson Overview (3 Min)	• Draw stem on plant part poster if it is not there already. • Hold up 3-4 different stems (celery, bok choy, rhubarb, and asparagus) and explain that we will learn about the function of stems and how stems are like the bones in our bodies. In today's class you will: • Plant an indoor leaf garden. • After class, you will have a stem snack.
Function of Stems and Bones (10 Minutes) • **Stems transport nutrients** • **Celery and red food dye experiment**	**Stem Function: Transport** • Stems carry water and nutrients up and down the plant. • Stems have special tubes to do this. (If appropriate for 3rd grade: The tubes that carry the water and nutrients upwards into the leaves are called xylem. The tubes that carry food and water downwards are called phloem- draw a cross-section sketch). • The stem is like an elevator transporting water and nutrients up and sugars back down to nourish the plant. • Celery is a stem. We will set up an experiment to watch a stem do its job. • In front of class fill a cup with water, place the stem inside and then add the red dye, explaining that we use

	the red dye to follow the path of the water. Without the dye we would not be able to watch the movement of water and nutrients up and down. • Ask for predictions. Explain that we will look again next week.
• **Stems support the plant**	**<u>Stem Function: Support</u>** • Another function of a stem is to support or give structure to the plant. Most stems hold the leaves, flowers and fruits up in the air and help keep plants from blowing over in the wind. Some stems lie on the ground: these are called vines. One example of a vine is a pumpkin plant. • We eat a lot of different plant stems. Can you think of any? *celery, rhubarb, bok choy, asparagus.*
• **Stems are like Bones** • **Skeletal System- Calcium**  • **Calcium in the bones makes the bones strong**	• Analogy: Stems, when filled with water, support/hold up the plant as bones support our body. Feel your spine and notice the bones in it. • Stems are like your bones. Bones hold our body upright. If you've ever seen a skeleton, you might think bones are dry and not "alive" like the rest of your body. But bones are alive! They grow and change with your body. They are slightly flexible, and very strong. • Just like water helps stems stay strong, Calcium is a nutrient our bodies need to keep our bones strong. What do you think happens if we do not eat enough Calcium? • Demonstrate the chicken bones soaking in milk and soaking in cola experiment. Show how the milk makes a bone stronger, and how the cola eats away at the bone. Snap the cola-soaked bone in half with ease. You should not be able to break the milk-soaked bone without a great deal of difficulty. Leave the milk-soaked bone intact.
Healthy Meal: Calcium (10 Min)	• Show the Healthy Meal Tray (it should already have a protein and one vegetable). • "Today we are going to fill in the third food group on our Healthy Meal tray. We are going to fill in the Milk group. Foods in the Milk group have lots of Calcium. • Hang the blue colored milk food group label on the board. Can anyone name some foods from the Milk group?" List suggestions on the board under the label. • **<u>Serving Sizes:</u>** You should eat 2-3 servings of Calcium rich foods each day. One serving of vegetables is ½ cup, and one serving of dairy products is 1 cup of milk or yogurt, or 1 ½ oz of cheese. 1 ½ oz of cheese is about the size of two of your fingers.



Nutrition Information about Calcium

- **Foods with Calcium:** The stems and leaves of dark, leafy greens, like kale and bok choy are a good source of Calcium (1 ¼ Cup of cooked bok choy = same amount of Calcium in 1 Cup milk). Dairy products, like milk, cheese and yogurt are also good sources of Calcium. Although dairy products have more Calcium than vegetables (Calcium is absorbed more readily from dairy than from vegetables), vegetable sources of Calcium can supplement the Calcium you get from dairy products. For people who can't have milk or other dairy products (lactose intolerant), vegetables such as beans, broccoli, bok choy, tofu, and nuts such as almonds are good non-dairy sources of Calcium.
- **Calcium makes our bones strong!**
- Place milk group food model onto healthy meal tray.

Planting a Leaf Garden (30 Min)

- **Working in teams**
- **Making a plan**

Planning the second indoor garden

- Introduce the theme for this garden planting. This is going to be a leaf garden: kale, lettuce, tat soi, bok choy, mustard greens, turnip.
- Draw a sample plan of an indoor garden jug and a sample choice of what would go in it. Educator draws a sample on the board of a birds-eye view into the jug (lines for rows, and write name of each plant on each row).
- Have students in learning teams choose three of the vegetable seeds that they want to put in their garden.
- Make popsicle stick labels. Have students write on these and label their furrows before planting.
- Give each child a number corresponding to a job.
- Model each job before planting with students.
- When plan is complete students receive seeds in cups and begin the jobs.

- **Planting the garden**

Planting

Each team will plant 15 seeds. Demonstrate each job in front of the class. For K and ELL walk them through each step as they do it, assigning each a number for a corresponding job.

Assign one planting job per student in a team

- **Fill the jug with soil.** Have a student come up to the soil bucket and scoop potting soil into the jug, tapping its base on the desk in order it to settle the soil. Return to the team. Make labels on popsicle sticks of vegetable names.
- **Make furrows in the soil.** Gently smooth the top of the surface of the soil with one hand. On the surface of the

	soil with the edge of your hand, push, or indent into the soil approximately ¼". This is as tall as your pinky laying sideways in the soil. Do not make furrows too deep or the seeds will get buried too deeply and not be able to sprout. • **Pass out seeds.** One student puts one type of seeds into their own palm, and with thumb and forefinger, gives a seed to each student. Repeat for all three types of seeds. • **Each student plants seeds:** Each student plants 3 seeds. • **Cover up seeds with soil.** **<u>Tips</u>** • Color code cups and popsicle sticks for each type of seed and its name. • Water well, but gently. Supervise each team so that every jug gets enough water (not too much), and to make sure seeds are not pushed down into the soil by watering with too much force.
• **Wash Hands**	**<u>Hand Washing</u>** Remind students that they need to wash their hands after gardening. Each student should wash his or her hands with warm water and soap for 20-25 seconds.
Healthy Snack: Celery (2 Min)	Give the healthy snack of celery to the classroom teacher (in front of the students). After class the teacher will give one 2-inch piece of celery to each student. Ask students to remind their teacher to share the celery snack with them after class. Students should wash their hands before eating the snack.
Review and Reflection	• **Plant Part Learning Contract:** Hang contract in front of class. Give each learning team a picture(s) of a stem (celery, rhubarb, bok choy, and asparagus). Have 1 student take each stem picture and tape it onto the plant part learning contract. (Goal is for students to identify as many stems that we eat as possible and the key nutrient in the plant.) Review the key nutrients, as they are posted on the poster, by pointing to the body parts they benefit. • **Check on gardens.** Ask students what they think is growing the best, indoor gardens or outdoor. • **Check on stems experiment.** • **Conduct Classroom Tasting Challenge.** After tasting the <u>celery</u> snack, ask students to raise their hands to show you how many students tasted, liked or did not like the snack. Record the number of

students who raise their hands in the appropriate column on your Classroom Tasting Challenge checklist, out of the total number of students in class that day.

Lesson Materials

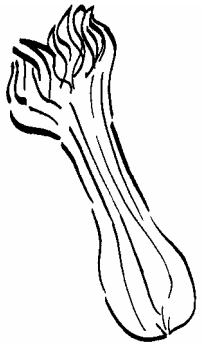
Growing with Stems

- **Stem Pictures for Plant Part Poster**
- **Bok choy Food Label**
- **Educator Background: Stems, Skeletal System, Calcium and Fiber**

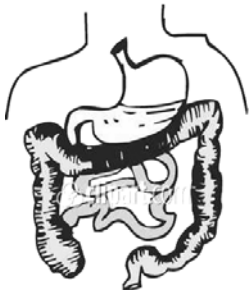
Supplementary Activities

- **Student Assessment Grade 1**
- **Assessment Key**
- **Student Assessment Grades 2-3**
- **Assessment Key**

Pictures for Plant Part Poster Review

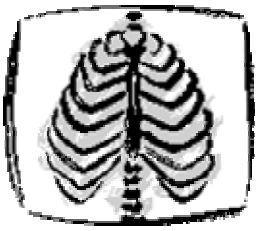


Celery



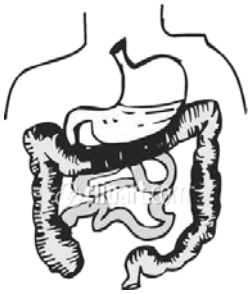
Fiber

Rhubarb



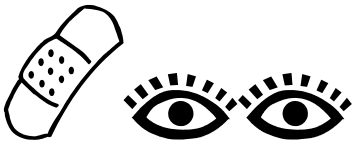
Calcium

Asparagus



Fiber

Bok choy



Vitamin A
Vitamin C

Bok choy (cooked)

1. **Have you seen food labels like this before?**
2. **Look at the bottom block: this is the vitamin and mineral section.**
3. **Which vitamin has the highest number that you see?**

Nutrition Facts

Serving Size 1 cup, shredded (170g)

Amount Per Serving

Calories 20	Calories from Fat 2
	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Cholesterol 0mg	0%
Sodium 58mg	2%
Total Carbohydrate 3g	1%
Dietary Fiber 2g	7%
Sugars 1g	
Protein 3g	

Vitamin A	144%	• Vitamin C	74%
Calcium	16%	• Iron	10%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

NutritionData.com

Educator Background Materials

Stems and Geotropism

Tropism refers to a plant moving toward or away from something. You are probably familiar with plants moving toward or away from the sun. When plants move toward or away from the earth it is called geotropism. Roots grow down in response to gravity and stems grow up, against the pull of gravity, toward the sun. These two very different actions still share the same term of geotropism, because they both refer to a plant's response to gravity.

Stem Function - Transport

Stems carry water and nutrients up and down the plant in special tubes, much like the plumbing in your house. The tubes that carry the water and nutrients from the roots upwards into the leaves are called xylem. The tubes that carry food and water downwards are called phloem.

Stem Function - Support

Stems hold up the plant. Some plants, called vines, need a little extra help to stand up so they wrap themselves round and round something strong, sometimes even another plant. They often send out little tendrils that grab onto the support. Gardeners put up trellises or poles to help food plants that are vines, such as peas and beans, grow upwards. Other vines, such as cucumbers and melons, prefer to grow along the ground. Most tomatoes are vines that will crawl along the ground unless they are tied up to a stake. Why can stems have such different growth forms? They can adapt to living in special environments.

Skeletal System

Stems are like your bones – bones hold your body upright. If you've ever seen a skeleton, you might think bones are dry and brittle, but they are not. They are flexible enough so that they hardly ever break when you fall down. Are your bones the same size they were when you were a baby? No, bones grow and change just like the rest of your body. Scientists call all of our bones together the skeletal system.

Reach around and feel your spine. Your spine, along with other bones, holds you upright. The spine has 33 bones in it. The joints between the bones in your spine allow you to move and twist in all directions.

When we talked about muscles we learned that the heart is a muscle - a very important one. Does anyone know the name of the bones that form a big cage to protect the heart and other organs in your body? The ribs. Can you feel your ribs? Ribs come in pairs - one on the left side of your body and one on the right side. Most people have 12 pairs of ribs, but some people have one or more extra ribs.

Calcium

Our entire body is supported by bones and in order for them to grow and be strong; we need to make sure that our bodies get enough Calcium. Calcium is a mineral, a substance that our body needs to be healthy. The stems and leaves of dark, leafy greens, like kale and bok choy are a good source of Calcium as are beans, broccoli, tofu and almonds. Dairy products, like milk, cheese and yogurt are also good sources of Calcium. However, some people are lactose intolerant meaning they cannot eat or drink milk products. Their bodies do not have the specific enzyme that is required to digest the sugar in milk, called lactose.

Stems as a Food Source/ Fiber

We eat a lot of different plant stems, such as celery, rhubarb, bok choy and asparagus. Stems are an excellent source of fiber. Look at a celery stalk and notice the ribs running down the length of the celery. The ribs are the fiber. Fiber is important for our bodies. It is plant cell tissue that is not digested by our bodies, but it helps to keep food moving through the small intestine. Water is also very important in keeping our intestines clean. Fiber absorbs water and helps push the indigestible food through the small intestine and into the large intestine. High fiber diets help prevent certain diseases. Whole grains, beans and fresh fruits and vegetables are excellent sources of fiber.

Growing with Stems

Name:_____ Date:_____

Draw two vegetables that have Calcium.

Draw two dairy foods that have Calcium.

Calcium is good for your bones. Draw a picture of someone who is eating a lot of Calcium.

Assessment Key: Grade 1

Growing with Stems

Name:_____ Date:_____

Draw two vegetables that have Calcium.

Any two of: Bok choy, Kale, Broccoli, Tofu, Almonds, Beans

Draw two dairy foods that have Calcium.

Any two of: Milk, yogurt, cheese, etc.

Draw a picture of yourself eating your favorite Calcium food.

Any food high in Calcium

Student Assessment: Grades 2-3

Growing with Stems

Name:_____ Date:_____

1. How is a plant stem like your skeleton?

_____

_____

2. What is the stem's other job in a plant?

_____

_____

3. How does Calcium help our bodies grow?

_____

_____

4. List 2 plants that have Calcium:

_____

_____

5. List 2 dairy foods that have Calcium:

_____

_____

Assessment Key: Grades 2-3

Growing with Stems

Name:_____ Date:_____

1. How is a plant stem like your skeleton?

Helps support the plant

2. What is the stem's other job in a plant?

Transports water and food to all the parts of a plant

3. How does Calcium help our bodies grow?

Makes our bones strong

4. List 2 plants that have Calcium:

Any two: bok choy, broccoli, tofu, almonds, beans, kale, other leafy greens

5. List 2 dairy foods that have Calcium:

Any two: milk, yogurt, cheese, etc.