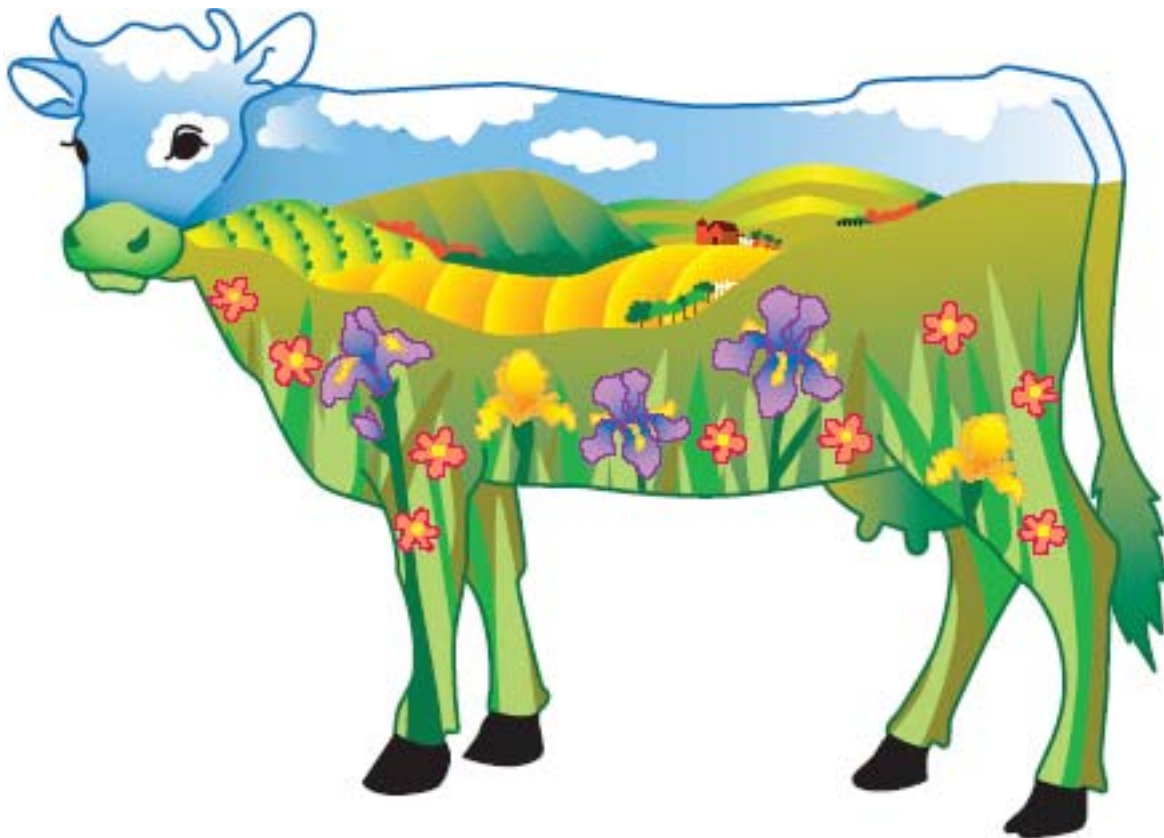


SOLE
Sciences of Life Explorations:
Through Agriculture
Grades 4 and 5



Teacher Guide
Unit: Grow an Indoor Salad Garden

UNIT PLAN

UNIT TITLE

Grow an Indoor Salad Garden

MONTH

March

GOAL

In this lesson, students will compare and contrast the needs of indoor and outdoor plants. They will take on responsibility for raising three different types of plants indoors and learn their specific needs. They will chart all steps in the plants' life cycles and make observations on their growth. Students will also conduct a survey and use the results to make a chart.

OBJECTIVES

Students will:

1. Categorize survey findings and present their results using a chart. (NYS Learning Standard 1: Language for Information and Understanding, Elementary 1 and Elementary 2)
2. Predict and observe stages in plant growth, in chronological order. (NYS Learning Standard 1: Language for Information and Understanding, Elementary 2 and Standard 1: Analysis, Inquiry, and Design, Elementary 5)
3. Use a calendar and a seed packet to calculate and determine harvest dates for plants. (NYS Learning Standard 1: Language for Information and Understanding, Elementary 2 and NYS Learning Standard 1: Analysis, Inquiry, and Design, Elementary 2)
4. Demonstrate understanding of vocabulary related to plant growth and companion planting by constructing both simple and complex sentences. (NYS Learning Standard 1: Communication Skills, Checkpoint A and B)
5. Investigate differences between indoor and outdoor plants, concerning their needs and how they satisfy them. (NYS Learning Standard 1: Analysis, Inquiry, and Design, Elementary 1 - Scientific Inquiry)
6. Explore rates of plant growth using simple measurement methods, and interpret the data in order to recognize simple patterns or sequences. (NYS Learning Standard 1: Analysis, Inquiry, and Design, Elementary 2 and 3 - Scientific Inquiry)
7. Construct an indoor salad garden using familiar materials. (NYS Learning Standard 1: Analysis, Inquiry, and Design, Elementary 1 - Engineering Design and Standard 5: Technology, Elementary 2)
8. Recognize the differences between indoor and outdoor plants, the interactions between plants, and different growth structures and interactions. (NYS Learning Standard 4: Science, Elementary 1)

TERMS

These terms are highlighted in bold throughout the lesson pages.

germinate - when the plant's seed has opens and sends up its first stem

harvest - to gather crops when they are mature and ready to eat or store

herbs - a group of plants that are used for flavoring or seasoning food or drinks

hypothesis - an explanation for something based on what has occurred, an "educated guess"

observations - paying attention to how things occur or work and making a note of it

prediction - a good guess of what will happen based on your knowledge

root vegetables - a group of vegetables with the edible portions growing underground (includes carrots, potatoes and radishes)

suppress - to reduce or stop something from happening

Integrated Pest Management is a specialized form of environmental management wherein scientific research and real world application work together to reduce pests such as insects, diseases or weeds.

- 1. Properly identify pests*
- 2. Learn the pest/ host biology*
- 3. Sample the environment for pests*
- 4. Determine an action threshold*
- 5. Choose the best tactic*
- 6. Evaluate results*

SAFETY

General classroom safety practices should be followed. Caution should be used when handling scissors and students should wash hands before and after handling seeds and soil.

Standards Matrix for this Lesson:

Standards:										
Month	Unit	Math/Science/and Technology	English Language Arts	Social Studies	HEALTH	ARTS	Food & Fiber Literacy	CDOS	Other Languages	Interconnectedness
3	Grow an Indoor Salad Garden	1:7 e1	1:3 e1							
		1:7 e2	1:3 e2							
		1:7 e3	1:6 A							
		1:7 e5	1:6 B							
		4:10 e1								
		5:11 e2								

Matrix Key:

NYS Learning Standards arranged by Standard: Category, Level

e = elementary i = intermediate

Categories:

- | | |
|---|--|
| 1 Career Development | 10 Science |
| 2 Universal Foundation Skills | 11 Technology |
| 3 Language for Information and Understanding | 12 Interconnectedness: Common Themes |
| 4 Language for Literary Response and Expression | 13 Interdisciplinary Problem Solving |
| 5 Language for Social Interaction | 14 History of the United States and NY |
| 6 Communication Skills | 15 World History |
| 7 Analysis, Inquiry, and Design | 16 Geography |
| 8 Information Systems | 17 Economics |
| 9 Mathematics | |

ADDITIONAL RESOURCES

<http://www.kidsgardening.com/2006.kids.garden.news/jan/pg1.html>

SUPPLIES AND EQUIPMENT

For each container garden:

9-10 Kentucky Pole Bean seeds

1 packet (or less) of radish seeds

1 packet (or less) of leaf lettuce seeds

1 plastic or ceramic container designed for plants, with drainage

3 wooden or plastic sticks

Pitcher or jar for watering

Strong natural lighting from a window, or fluorescent lights

Potting soil

Ruler for measuring growth

Journal paper - create a journal or use an existing journal

BACKGROUND FOR TEACHERS

Students will have the opportunity to put what they have learned about the needs of plants, and how seeds germinate, into action. Students can grow three different plants in the same container and observe how they differ and interact. Indoor and outdoor plants all have the same needs, but indoor plants rely completely on us to provide those needs. Two challenges for indoor gardens are keeping the container moist - not too dry or too wet - and providing enough light.

Students will be able to follow the indoor salad garden like a science experiment. They will work in a group to start the plants. They must read the seed packet and estimate the time the plants will be ready, by using a calendar. We suggest you have more than one container, if possible.

Each student or group must keep a detailed record of plant development. Students are also asked to write their observations in a journal. You may choose to create journals solely for this purpose, or use existing journals your students may be already be keeping. We've included a list of things that students can look for while they observe plant growth. This is an introduction to the scientific method.

A math activity is available for use during the growing period. Students will create a list of their top ten favorite salad toppings. They will then be directed to ask at least five other people to pick their five favorites from that list. They will tally and chart the poll results. A sample is provided.

Even if you are not an experienced gardener or don't have success with houseplants, don't be reluctant to give this project a try. Students will learn that growing plants is not always easy. Indoor plants can dry up over vacation, or grow long and leggy trying to find sunlight! Even the best of care cannot always prevent problems. This is all part of the process of learning!

Containers should be at least one foot in diameter to accommodate the roots of the plants while growing. Remember to have students slowly add water to the potting soil. Always use clean pots and new potting soil for your projects. Outdoor soil is not a good substitute. Soil should be evenly moist, or even a little wet to start. You will not want to have to add water right away. Remind students that pouring water too quickly onto the soil may wash away small seeds and seedlings. If you are having trouble with soil drying out quickly, or will be out of the classroom for more than two days, try placing a clear vinyl bag over the entire container and poles. Pull it snugly around the container and secure with a bag tie or clip. This will retain some of the moisture. If you have more than two containers, you could keep one in this "mini-greenhouse" environment and uncover the others as they begin to grow. Once seeds are established and growing, they are not as sensitive to drying out.

QUESTIONS FOR STUDENTS

What do plants need to grow?

Do indoor plants have different needs than outdoor plants?

How do plants interact?

Are plants easy to grow?



INTEREST APPROACH ACTIVITIES

Harvest Your Hydroponic Garden

Background:

This interest approach activity is dependent upon the previous lesson, "Simplified Floating Hydroponics," in which students will have grown butter-crunch and romaine lettuce along with basil in a hydroponics system. After approximately four weeks, the produce should be ready for harvest. Inform students ahead of time that on the day of harvesting students should bring in one of their favorite salad toppings and/or salad dressing from home to share with the class. They will then use these toppings to create their ideal salad.

Materials:

Large salad bowl

Paper plates

Plastic utensils

3 pairs of scissors

Colander

Paper towels

Salad utensils or tongs

Harvested produce

Water (for rinsing produce)

Salad dressing*

Procedure:

1. All students should wash their hands with soap and warm water before handling the produce.
2. Students should take turns harvesting each type of produce from their hydroponics garden using scissors (the butter crunch and romaine lettuce can be placed in the colander together, but the basil should be placed on a separate plate).
3. All produce (including any brought in by the students) should be washed and patted dry with a paper towel.
4. Place the salad greens (lettuce) in the large salad bowl after washing and drying, and mix together using salad tongs.
5. Students (with the help of their teacher) should cut any produce they brought in and place it on paper plates to share with the rest of the class.
6. Set up an assembly line on a counter or table, with all the ingredients.
7. Students form a line and pass through the assembly line/salad bar, adding toppings and dressing to their salad plate.
8. Sit down and enjoy the freshly made salad!

* 1 part oil, 3 parts balsamic vinegar, and Italian seasoning make a simple, tasty dressing.

(For related activities refer to students worksheets #1 & #6A-B)

SUMMARY OF CONTENT

- I. Introduction
 - A. Gets students thinking about plant needs and salad ingredients.
- II. What Do Plants Need to Grow?
 - A. Asks students to compare the needs of indoor and outdoor plants.
- III. What Plants will You Grow?
 - A. Discusses the three types of plants for the salad garden: pole beans, leaf lettuce, and radishes
 - B. Terms include harvest and root vegetables.
- IV. Planting the Garden
 - A. Provides a list of supplies, diagrams, and instructions for planting indoor salad gardens.
 - B. A growth chart is provided at the end of the unit.
- V. Estimate Your Harvest Date!
 - A. Asks students to use the seed packet to fill in harvest data and consider what will affect plant growth.
- VI. Salad Survey (2 Pages)
 - A. Page A asks students to choose their top ten salad ingredients.
 - B. A survey sheet is provided.
 - C. Terms include prediction and hypothesis.
 - D. Page B asks students to chart their results and compare them to a hypothetical sample class
- VII. Plant Growth Journal
 - A. Questions are provided for students to answer as they watch their salad gardens grow and finally harvest them.
 - B. Terms include observations and germinate.
- Vocabulary and Review
 - A. Definitions and four review questions.

TEACHING-LEARNING ACTIVITIES

- I. Introduction
 - A. Use this page to start discussion and stimulate interest.
- II. What Do Plants Need to Grow?
 - A. The questions may be answered individually or as a class.
 - B. Remind students that indoor and outdoor plants have the same basic needs
- III. What Plants will You Grow?
 - A. Students may read individually, but main points or differences could be emphasized in a class discussion.
- IV. Planting the Garden
 - A. Use this page as a guide for planting your indoor salad garden.
 - B. Provide written instructions to group along with supplies.
 - C. Start to fill in the growth chart.
- V. Estimate Your Harvest Date!
 - A. Have students complete this page individually and then discuss the answers.
- VI. Salad Survey (2 Pages)
 - A. Discuss the first page as a class.
 - B. Students can complete the survey as a class activity or a homework assignment.
 - C. You may choose to create a large chart of the class's results to answer the questions on page B.
- VII. Plant Growth Journal
 - A. A journal cover is included at the end of the lesson.
 - B. Discuss the questions in class to get students thinking about things to look for.
- Vocabulary and Review
 - A. Complete individually

Student Lesson: Grow an Indoor Salad Garden!

Introduction

When leaning about hydroponics, you learned about the needs of plants and about seeds. Let's put that knowledge into practice, and grow an indoor salad garden. This time, we'll plant the seeds in soil.

A garden does not have to be big. You will use a container, keep it indoors, and supply all the plants' needs yourselves.

Are you ready for the challenge? Do you think it will be easy?

As you know, tossed salad usually starts with a type of salad green. This can be iceberg lettuce, leaf lettuce, romain, uncooked spinach, or even dandelion leaves!

Then, we can start adding things like vegetables, nuts, fruits, cheeses, meats, and other toppings. A salad can be a whole meal! You know that you should eat a well-rounded diet of greens, vegetables, fruits, grains, proteins such as beans or meats, and oils each day. You need proteins, carbohydrates and vitamins and minerals. The best way is to eat a variety of things. A fun way to do that is to make a salad!

Think about these questions:

What do plants need, in order to grow?

Do indoor plants have different needs than outdoor plants? Explain your answer.



name _____

Student Lesson: Grow an Indoor Salad Garden!

What do plants need to grow?

List three things plants need

1. _____

2. _____

3. _____

Can you think of one more?

4. _____

Do indoor plants need different things than outdoor plants do? Not really. But there are differences in how to provide those needs. What are some differences between growing plants inside and growing them outside?

INSIDE

OUTSIDE

Student Lesson: Grow an Indoor Salad Garden! What Plants will You Grow?

Our indoor garden will consist of two different types of plants:

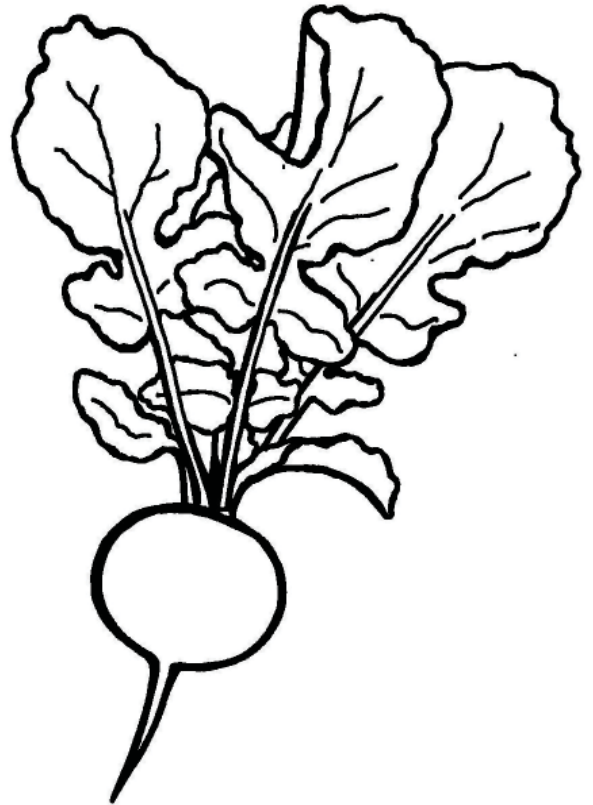


We are going to grow leaf lettuce. You are probably familiar with head lettuce (iceberg lettuce). You will see the difference as it grows.

Lettuces actually prefer cooler weather to hot summers. Once you've planted your lettuce seeds, you can expect to harvest lettuce in 45-60 days.

Radishes are root vegetables. You will see leaves growing above the ground, but the part we eat is below the ground. Radishes are usually round and bright red. They are crisp and have an interesting flavor. They are fast-growing, so you will see them sprout very quickly. They will be ready in as little as 25 days.

What other root vegetables can you think of?



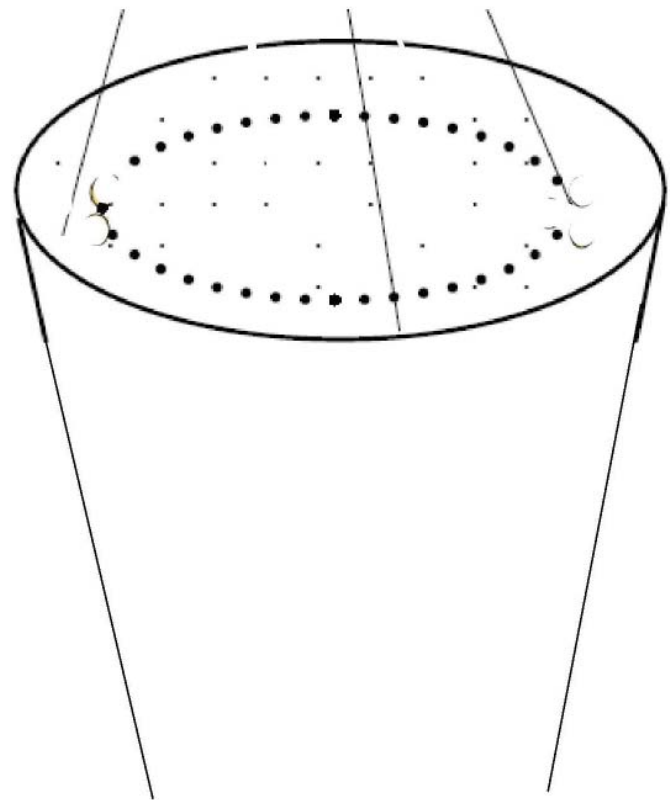
Student Lesson: Grow an Indoor Salad Garden! Planting the Garden



Each group will need:

- 1 package leaf lettuce seeds
- 1 package radish seeds
- 1 large plastic pot
- Potting soil
- 3 stakes or sticks (at least 24" tall)
- Ruler

1. Fill pot with soil and moisten it with water.
2. Add water slowly. It should be moist but not soaking wet.
3. Keep a little extra soil in the bag or container. You will need it to cover your seeds after you plant
4. Follow the diagram at right for planting seeds:
 - A. Create a circle of lettuce around the planter
 - B. Scatter about 20 radish seeds on top of soil
5. Cover very lightly with soil (don't cover radish deeply).
6. Water gently.
7. Place container near window or under fluorescent lights.
8. Create a chart to track growth. Include date and growth of plants.
6. Keep the seed packets for reference.



name _____

Student Lesson: Grow an Indoor Salad Garden! Estimate Your Harvest Date

Use a calendar and the seed packets to answer the following questions:

Today's date _____

According to the seed package, how many days will it be until the plants are ready to harvest?

Lettuce _____

Radish _____

Using a calendar, estimate your harvest dates:

Lettuce _____

Radish _____



Which plants will take the longest to be ready for harvest?

What factors can cause your plants to grow faster?

What factors can cause your plants to grow slower?

What factors can cause your plants to stop growing and die?

Student Lesson: Grow an Indoor Salad Garden! Salad Survey!



There are so many things to put in a salad. Do you like cheese or croutons? Carrots or chicken?

Now that you've had some time to think about salads, and while your salad garden is growing, let's do a survey!

As a class, make a list of the top ten things that can be put on a lettuce salad. Copy the list, take it home, and ask your family and friends what their favorite thing on the list is. Ask a parent or guardian about calling grandparents, aunts, uncles, or cousins on the phone to get their answers. Try to get at least five different people to take part in your survey.

When you and your classmates have completed the surveys, gather as a class and count how many people chose each item on your list. When you are done, you will find out the most popular salad items and the least popular salad items.

Before you continue, make a guess as to what the most popular topping will be. This is a prediction. If you have a good explanation for your prediction, it is called making a hypothesis! You will be guessing the outcome of an experiment based on your knowledge and experience.

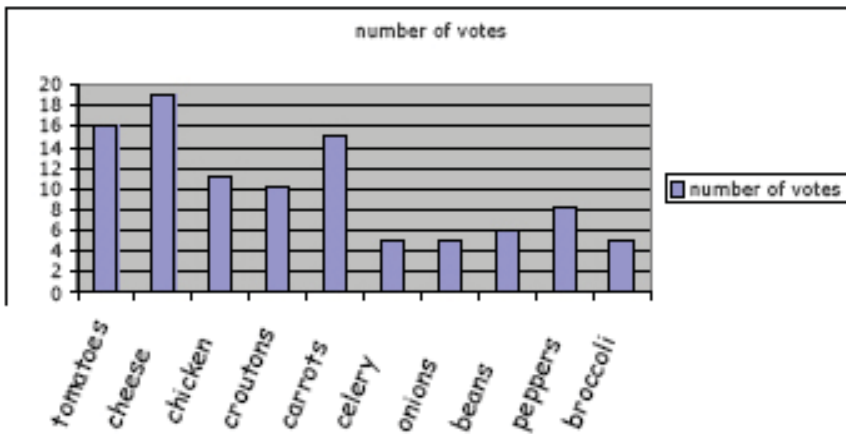
We can take the findings of the survey and put them into a chart. This will show you the results in a powerful way.



Student Lesson: Grow an Indoor Salad Garden!
Sean's Survey Results

Sean's classroom did a salad survey. They had 10 choices in their survey. Each of the twenty students in the class asked five people. That totaled 100 votes. Sean's teacher listed the choices on the board and made a slash mark next to each choice when it was picked in the survey. Then they counted and totaled the votes.

	number of votes
tomatoes	16
cheese	19
chicken	11
croutons	10
carrots	15
celery	5
onions	5
beans	6
peppers	8
broccoli	5
	100



Sean's class put the information into a chart. They decided that a bar graph would show their results best.

Try making a chart with your salad survey results.

In Sean's class:

What is the *most* favorite topping?

What is the *least* favorite topping?

In your class:

Did your class choose all the same toppings?

What is the favorite topping in your class?

Student Lesson: Grow an Indoor Salad Garden! Plant Growth Journal

Your teacher will direct you to start a plant growth journal. Use the chart included in this lesson to track important dates. Scientists also track observations. This means they write down things they notice. Use the journal to make observations!

During the time your indoor salad garden is growing, consider these things:

Do the plants seem to take a long time to germinate?

Do the plants germinate or start at the same time?

Do the leaves all seem the same or are they different?

Do the colors of the leaves vary?

Do the shapes of the leaves vary?

Do the plants have flowers?

Do some of the plants have flowers?

Do any of the plants grow in clumps?

Do any of the plants grow like a vine?

Do they seem to be healthy?

How often do you have to water the plants?

Do the plants sometimes look like they need water?

Do the plants look yellow?

Continue your journal as you harvest your crop:

What is the first plant you harvest?

Did it look like you thought it would, if not, what is different?

Did you taste it?

What is the difference in the way you harvest the plants?

Was your indoor garden a success?

Would you do something differently next time?



Student Lesson: Grow an Indoor Salad Garden!

Vocabulary and Review

germinate - when the plant's seed has opens and sends up its first stem

harvest - to gather crops when they are mature and ready to eat or store

herbs - a group of plants that are used for flavoring or seasoning food or drinks

hypothesis - an explanation for something based on what has occurred, an "educated guess"

observations - paying attention to how things occur or work and making a note of it

prediction - a good guess of what will happen based on your knowledge

root vegetables - a group of vegetables with the edible portions growing underground
(includes carrots, potatoes and radishes)

suppress - to reduce or stop something from happening



1. Some vegetables grow on a vine, some grow under the soil surface

___yes ___no

2. Plants grown indoors need us to supply soil, water and _____

3. We can guess when vegetables will be ready to eat by reading the _____. It tells us how many _____ until the plants are ready to harvest.

Integrated Pest Management is a specialized form of environmental management wherein scientific research and real world application work together to reduce pests such as insects, diseases or weeds.

- 1. Properly identify pests*
- 2. Learn the pest/ host biology*
- 3. Sample the environment for pests*
- 4. Determine an action threshold*
- 5. Choose the best tactic*
- 6. Evaluate results*

Teacher Information for Student Worksheets

Student Worksheet 1

Introduction

Students will enjoy the challenge and responsibility of taking care of growing indoor plants. Radishes are a common topping used in salads. Later in this lesson, students will be able to discuss a variety of salad toppings and take a survey of their friends and family.

Ask students why different plants might be able to grow well together in a small container. As they learn about these types of plants, they will learn that they grow in different spaces, at different times and mature differently.

Student Worksheet 2

What do Plants Need to Grow?

Indoor plants are totally dependent on people taking care of them. Outdoor plants can get by with the sun, rain and soil of their environment. The needs are not different, but the sources are.

Answers:

1-4. Soil, Air, Water, Nutrients, and Sun

5. Plants don't have different needs, but when plants are grown inside, they depend on people to provide those needs. If we don't water them or give them sunlight or lamplight, they will not be healthy. Farmers can't control rain or sun. They can sometimes supplement rain by watering. They can add nutrients to soil and reduce compaction, but they can rarely change the soil in major ways.

Student Worksheet 3

What Plants Will You Grow?

The plants chosen for this project grow very differently. Students will see that some seeds are very small and grow into something that looks nothing like the seed (radish and lettuce). Lettuce and radishes grow relatively quickly. Lettuce can be harvested and will grow back. Radishes are a root vegetable, and grow under the soil surface.

Student Worksheet 4

Planting the Garden

You can choose the number of containers you start. You will need at least one package of leaf lettuce, radish and bean seeds. There will be a lot more of the tiny radish and lettuce seeds, probably enough to do two or three containers. You will need nine or ten bean seeds for each container. If you have extra seeds, they can be kept in a cool, dry area for a second year, but you may have reduced germination. Have students add water slowly until the soil is well-moistened. The container needs drainage; make sure to place a dish or bowl beneath it. Watch water levels in this bowl. Plant seeds when the soil is moist.

Go over planting directions carefully with students. Show them how to read the seed packet for planting depth and days to maturity. This is the time to start using the growth chart provided at the back of the student pages. Fill in the first two lines "Date planted" and "Number of seeds planted."

Students will hopefully have more than one seed germinate. You may ask them to measure the height or length of the first plant, or average the heights of all plants for the first or second weeks. Remind them to track the three different vegetables differently. They can determine percentage of germination a week after the first week. If they planted twenty lettuce seeds and only fifteen seeds germinated, they had 75% germination. After determining germination rates, they should thin some of the plants out as they grow. Ask them why thinning plants may be good for them (Plants that are overcrowded tend to be smaller because they are sharing nutrients and water, as well as light source).

Student Worksheet 5

Estimate Your Harvest Date!

Another difference in these three plants is that leaf lettuce can sometimes be cut back and will grow more leaves. This will depend on various factors such as variety, and growing conditions. Once students have determined their possible harvest dates on the worksheet, remind them to also fill it in on their growth chart.

Student Worksheet 6-A

Salad Survey!

Some students like salad and other don't. This is a good opportunity to discuss nutrition and preference. Solicit students' ideas of good toppings for a tossed salad. Narrow this list down to the top ten favorites. Print out copies of the survey sheet at the back of the teacher's pages. Have students list the ten topping choices they will use in their survey. They should ask at least five different people. Ask them if they think it will make a difference who they ask (ex: parents, siblings) Does age or gender make a difference? Ask them which topping they think will be the most popular, or the least popular. Why do they think so? This is a good time to discuss the Scientific Method.

Student Worksheet 6-B

Sean's Salad Survey

A survey example is given to students. Does Sean's list differ from your class's? Plan to make a chart similar to Sean's..

Student Worksheet 7

Plant Growth Journal

A journal cover is included at the end of this unit. Students may color it in and fold it, along with blank sheets of paper, into a small booklet for their journals. If your students already journal daily, you can could ask them to include their plant observations in their daily writing.

Discuss the plant observation questions in class to get them thinking about things to look for!

Student Worksheet 8

Vocabulary and Review

Vocabulary is provided for student reference. Students should complete the review question individually.

Answers:

1. Yes
2. Sun (light) or air
3. Seed packet, days

LESSON SUPPLEMENTS

name _____

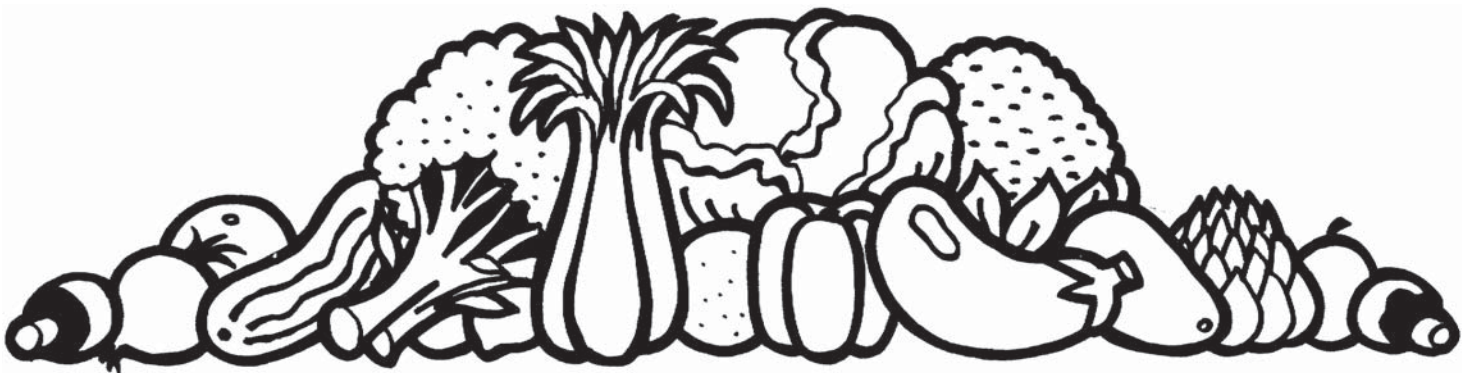
Student Lesson: Grow an Indoor Salad Garden!
Track Your Plants' Growth

Growth Chart

Radish

Lettuce

Date planted	_____	_____
Number of seeds planted	_____	_____
Number of seeds germinated	_____	_____
Date of first leaf seen	_____	_____
Estimated date of harvest	_____	_____
Height one week later	_____	_____
Height two weeks later	_____	_____
Date of first harvest	_____	_____
Percentage of germination	_____	_____



MY PLANT
GROWTH
JOURNAL



NAME:



SALAD SURVEY

Introduce yourself! "My name is _____ and I am taking a survey to find out which of these ten toppings you would most like to put on your salad."

List the ingredients in Column A. In Column B, place a mark every time it gets a vote. When you're done, count the marks in Column B and write that number in Column C. Be sure to say "Thank you" to everyone you survey!

A. Toppings	B. Votes	C. Total
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		