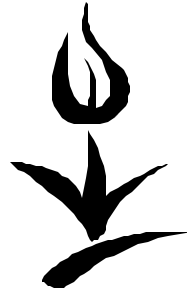


GETTING OUR HANDS DIRTY

A Kinesthetic Study of Plant Growth



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GETTING OUR HANDS DIRTY:
A Middle School Kinesthetic Study of Plant Growth
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Program Outline

Grade:

5-8 (this project can be adopted for all grades)

Students:

This program is appropriate for students who enjoy different types of learning. It was written with special education students in mind, mostly children with learning difficulties and behavior issues. Getting Our Hands Dirty will help students develop the ability to nurture life by growing plants from seed. Children are naturally kinesthetic learners, and our model allows our students to fully engage their minds and hands. Visual learners will have much to observe, too, and this program will help students develop an appreciation for the environment, a reason to respect their own neighborhood, and a learning experience that they will remember forever. They will study the biology of the plant from the beginning. They will learn how to nurture their plants, catalog their growth with computers, and present those findings. Edible plants, flower pressing, and dye-making add an aesthetic quality to our curriculum. When the young plants are ready, the students transfer them to growth cabinets until they grow to maturity.

Major Goals and Overview:

The major goals of this program are for students to develop:

- ?? respect for life and the environment
- ?? responsibility by nurturing their plants
- ?? an awareness of the environment
- ?? a cooperative attitude
- ?? self-esteem through plant growth
- ?? enthusiasm and love for plants and science



The joy of watching a seed come to life and the sadness of the death of a neglected plant allow students to acquire a first-hand understanding of what living things require and how to be responsible for them. This program allows students to develop a lifelong awareness of their environment and the potential impact they can have on it.

This hands-on approach will allow for cooperative as well as individual work. The students will work in small groups assisting each other with various technical skills. Three of the goals of this program are to integrate new media, learning standards, and various subject areas in a hands-on opportunity to develop and implement a school garden. Students will study and become familiar with the life cycle of a plant through the following subject areas:

Communication Arts:

-Reading of pertinent materials and other activities will be centered on the whole language approach in which students write reports of findings, discussion, and presentations. They also observe, describe, illustrate, and predict. Language skills will grow as they are stimulated by involvement in the program.

Science:

- Measurement and growth by chart
- Study of plant life, cell structure, and beneficial insects
- Nutrients, soil, pollution, the greenhouse effect, and weather patterns

Social Studies:

-Discussion of current issues concerning the environment including the rainforest and global warming

Math:

- Plotting of planting space (distance and area)
- Graphing
- Study of area

Art:

- Pressing flowers
- Making dyes from petals
- Drawings of findings to display



Timeline

This project continues through the school year into the summer months. Students study seed and plant growth in the fall, plant seeds in the grow lab, and continue into the winter by caring for their plants. Spring finds them using the plants they've grown as gifts, foods, and decoration.

August

Spend several days planning project with co-teacher.

September

Reach out to community resources that can help (New York Botanical Garden, local nurseries, school staff for old gardening equipment).

Take pictures of students during different project stages.

Students begin to study parts of the seed.

Students classify and observe different seeds in fruits and vegetables.

Start to read story "City Green."

Students watch planting videos in *The Magic School Bus* series.

Students discuss seed growing methods.

Discussion and planting of lima beans to observe general concepts in plant growth.

October

Set up grow labs.

Discuss planting procedures.

Sow tomatoes, peppers, and carrots.

Start houseplant cuttings for Christmas gifts.

Grow sprouts for tasting.

Start to collect materials for garden.

Set up and decorate the planting room.

Begin staff training at New York Botanical Garden.

Class trip to Botanical Garden.

Create a plant calendar.

Students study functions of parts of the plant.

Student study the tulip bulb.

Watch *How Seeds Move-Johnny Appleseed* video and book.



November

Study various kinds of plants and how they protect themselves.
Functions of the root.
The role insects play in plant growth.
Students study germination.
Leaves and trees.

December

Bring home houseplant gifts.
Sow more seeds, including lettuce, cucumbers, and beans.
Decomposition.
Worms and their role in soil maintenance.
Photosynthesis and soil.
Discussion and assembly of worm bin and composting.

January

Start marigold seeds for Mothers' Day gifts.
Plant "Mystery Seed."
Seeds will be sewn in winter under growth lamps.
Plant care.
Seed choice.
Discuss what plants provide for the world.
What would the world be like without plants?
New York Botanical Gardens- Trip to Conservatory Rainforest.

February-

Students read seed packets to find answers about planting.
Plant reports.
Draw garden designs.



March

Start seedlings for outdoor garden.
Monitor plants daily.
Make growth chart.
Use computers to write stories and poems.
Make predictions.

April

Transfer seedlings to pots.
Insect pollination and interaction with plants.
NYBG spring class trip.
Continue planting indoors with grow lab.
Build box gardens.

May

Transfer young plants outside.
Germinate new plants in grow lab.
Bring home Mothers' Day flowers.

June-

Press flowers.
Dry flowers.
Make dyes.
Tend the garden.
Show other students and staff the work, give guided tours.
Disassemble and clean grow labs.



Lesson Plans

Calendar of Lessons

September

1. What is a seed?
 - a. Classifying and observing seeds from an assortment of fruits and vegetables
2. What are the parts of a seed?
 - a. Looking inside of a seed
 - b. Draw, label and color parts of a presoaked lima bean
3. Read "City Green"
 - a. Vocabulary building--using context, clues, grammar, phonics, and decoding
 - b. Oral language activities--role playing
 - c. Strategic reading
 - d. Comprehension--cause and effect, facts and opinion, problem and solution
4. *Magic School Bus* Videos: Goes to Seed, Gets Planted

October

1. Where are seeds found?
2. How do seeds travel?
3. Who was Johnny Appleseed?
4. How do we make a timeline of events in *Johnny Appleseed* by Steven Kellogg?
5. Make applesauce
6. Creative Drama--students act out book
7. Trip to the New York Botanical Garden

November

1. What do seeds need to grow?
2. What is photosynthesis and transpiration?



3. What are the parts of a flower?
4. Why do leaves change color in the fall?
5. Why do plants need roots?
 - a. What is the job of the roots?
 - b. How do roots grow?
6. How do we take a root cutting?

Experiments

- ?? How does water get from a plant root to its leaves?
- ?? What do green plants need to be healthy?
- ?? Do plants really grow in the direction of sunlight?
- ?? Will vegetable plants grow differently in clay, sand, or garden soil?

December

1. How do some soils differ from others?
2. What is worm compost?
3. What is the life cycle of the worm?
4. How does a worm reproduce?
5. What is decomposition?
6. What is recycling?

Experiments

- ?? How do nutrients in the soil get into a plant?
- ?? How can we calculate the amount of fertilizer to use per quart or liter of water?
- ?? What is Ph? How does it affect plants?
 - litmus paper test of different soils
- ?? Set up worm compost
 - Continue care of compost

January

1. What plants live in a rainforest?
2. How do we make a rainforest terrarium in the classroom?



3. What is the cycle of nature?
4. Why are plants important?
5. How do plants and animals rely on one another?
6. How do plants protect themselves?

February

1. How do we read a seed packet?
2. How do we predict dates of germination and maturity based on information from seed packets and catalogs?
3. How can we make a plant report?
4. What design do we want for our school garden?

March

1. How can we write a poem about our plants?
2. Write, illustrate, and publish a collection of garden stories and poems.
3. How can we write a letter to our parents describing our indoor garden?
4. How does crowding affect the growth and quality of plants?

April

1. How do insects pollinate?
2. How do we transfer plants outdoors?
3. How do we build box gardens?
4. How do we care for our outdoor garden?
5. How do wind and insects aid pollination?
6. How do we identify some of the flower parts using a magnifying glass?

May

1. Build box gardens.
2. Take pictures.
3. Transfer young plants outside.
4. Germinate new plants in grow lab.
5. How can we plan to take care of the plants for summer vacation?



June

1. How do we press flowers?
2. How do we make plant dyes?
3. What plants can be used in our “Salad-bration”?
4. How can we be guides for our own indoor garden?
5. Continue to tend outdoor garden.

Sample Lessons

Lesson A:

Aim: What is a seed?

Objectives

1. Students will observe different seeds from various fruits and vegetables.
2. Students will count and graph the number of seeds from various fruits and vegetables (see Worksheet A).

Materials /Preparation

Apples	Green & red peppers
Avocado	Cantaloupe
Oranges	Tomatoes
Peaches	Cucumbers
Graph paper	Seed-sorting chart
Paper plates, paper towels	

Motivation

Ask students to share their favorite foods with the class. Put the responses on the blackboard and sort responses into the headings of “fruits” and “vegetables.” Students respond to what they like and dislike. Explain that these foods start from seed.

Activity

Have students sit at large table with all the fruits and vegetables. Students will cut open the fruits and vegetables.



1. Students will look closely at the opened fruits and vegetables.
2. Activity sheets show cross sections of vegetables and fruits. The students will mark on their activity sheets where they found the fruits and seeds.
3. Carefully count the seeds and record data on activity sheet.
4. Wash and dry seeds.
5. Observe seeds.
6. Graph the number of seeds (observations will be later entered into the computer).

Closure

- Come back to the blackboard and have students discuss the differences and similarities among the seeds.
- What did they observe?
- How many seeds did they find?
- Have students make and eat fruit or vegetable salad.

Homework

Journal writing to be later entered into the computer.

Lesson B:

Who was Johnny Appleseed?

Materials:

Johnny Appleseed written by Steven Kellogg
Johnny Appleseed video
Johnny Appleseed worksheet (see worksheet B)

Objectives:

1. Students will explore the legend of Johnny Appleseed and the history behind it.
2. Each child will make a Johnny Appleseed timeline of the places he visited and events in his life.
3. Students will recall facts from the story to build comprehension skills.



Motivation:

1. We will make applesauce.
2. How many ways can an apple seed get planted?

Activity:

1. Story will be read.
2. Have students discuss Johnny's journey.
3. Each child will come up with 2-3 sentences about Johnny's personality and write them in their journals.
4. A *Johnny Appleseed* video will be seen.
5. Make applesauce.

Homework:

1. Students will be given five questions to answer about Johnny Appleseed.
2. Students will recall and write the process of making applesauce.

Lesson C:

Biology of Flowers

Motivation:

Ten examples of flowers, from common ones to the more exotic, will be presented to the children.

Objectives:

1. Students will develop an understanding of the flower as a reproductive organ.
2. They will discover that living things are composed of many parts, all of which have a purpose.
3. They will realize that flowers play a vital role esthetically and have been used in such ways for millennia.

Vocabulary:

Please see worksheet C



Activity:

1. Children will each get two different flowers with similar reproductive anatomies. Students are instructed to dissect flowers using plastic knives. Parts will be named and catalogued by amount of each part found.
2. Students will compare findings and each part's purpose will be explained. Naming parts of the flower will proceed, followed by charting the parts of the flower. We will then harvest flowers we grew to press them by:
 - a. Placing a piece of blotter paper on top of a book or a flat board.
 - b. Then arrange the flowers on top of the paper.
 - c. Put another piece of blotting paper on top of the flowers.
 - d. Then add something heavy, such as a pile of books on top of that.
 - e. Let the books lie for a week.
 - f. Carefully remove books and top sheet.
 - g. Flowers can be placed in a frame, glued to paper to make greeting cards, or arranged on a bulletin board as part of the students work.

Follow up:

Connections can be made in health lessons with human reproduction.
Take a Spring trip to the New York Botanical Garden to see the flowering plants.
Make a dried flower arrangement.
Boil marigold leaves and tie-dye t-shirts.

Homework:

Write a narrative recalling what was done in class today.

Lesson D:

Aim: How do we think like a scientist?

Overview:

Students will be introduced to the grow lab. They will conduct a controlled classroom experiment using garden metaphors in place of traditional scientific method steps.



Students will be introduced to the grow-lab activities around seed planting, germination, and plant growth. They will begin to learn through the inquiry methods to ask questions and then set about to answer them using a hands-on science experience.

Materials:

- Various types of lettuce seeds
- Pots
- Seed starting material
- Grow lab
- Scientific method sheet using garden language

Method:

Students will be told that we now have a grow lab and they will be able to grow plants themselves. Teachers will brainstorm with the students what scientists do and review the scientific method. Teachers will help the students identify questions that can lead to a garden experiment with different types of lettuce.

Activity:

1. Plant a Question- Which lettuce seeds grow bigger and faster in the grow lab?
2. Sprout a Guess- Students will be encouraged to guess answers to their questions and predict the outcome of their experiment.
3. Design a Growing Experiment- We will introduce the students to the grow lab and how it works. We will plant various lettuce seeds in seed starting trays. Growth variables will remain consistent, variables being:
 - Climate of the garden room
 - Rotation of plants
 - Water and fertilize equally
 - Location of seedlings under the grow lab lights
4. Record of Fruitful Observations- We will measure and chart the height of the seedlings twice a week, on Monday and Thursday. We will take an average of the heights. We will graph the results using computers and describe, compare, and contrast the appearance of the lettuce plants. We will also describe observations with narratives, graphs, charts, drawings, and the use of the digital camera. Students will have an observation journal.



5. Harvest Conclusions- The students will use the records of observations to determine which type of lettuce grows bigger and faster using the grow lab. They will base their final conclusions on the total weight and height of each plant. Individual data tables will be written for each student's plant journal and the class will make a graph data table to track their harvest.
6. Compare & Contrast- Students will also record:
 - the color of the lettuce
 - the shape of the lettuce
 - crowding of the plants

Types of Assessments Used

To assess how much of this program the children will understand, teachers will review journals, drawings, and notebooks. Students will also share and compare their work.

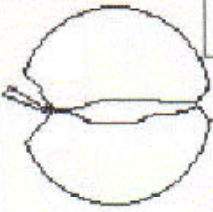
Other work produced by the children will include:

1. Portfolios to include samples of the students work
2. Student-made scientific booklets
3. Observation notes
4. Photos of students engaged in garden investigations
5. Drawings
6. Feedback from parents
7. Student's self-valuations of their own work

FRUIT DISSECTION AND SEED COUNTING Worksheet A

1. Look carefully at the fruits and vegetables.
2. Draw where you find the seeds.
3. Count the seeds and write down number.
4. Wash and dry seeds.
5. Compare your findings with other students.

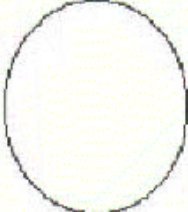
APPLE



Number of seeds

Shape of seeds

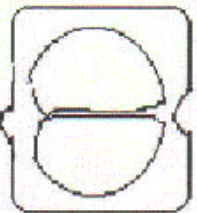
ORANGE



Number of seeds

Shape of seeds

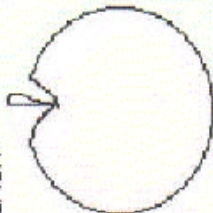
GREEN PEPPER



Number of seeds

Shape of seeds

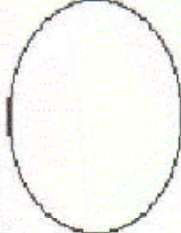
PEACH



Number of seeds

Shape of seeds


AVOCADO



Number of seeds

Shape of seeds


CUCUMBER



Number of seeds

Shape of seeds


TOMATO



Number of seeds

Shape of seeds

CANTALOUPE



Number of seeds

Shape of seeds

WORKSHEET B

QUESTIONS ABOUT JOHNNY APPLESEED

1. WHAT ANIMALS BECAME HIS FRIENDS?

2. WHY DID PEOPLE CALL HIM JOHNNY APPLESEED?

3. WHAT COULD YOU DO TO BE A FRIEND TO JOHNNY?

4. WHAT WAS THE HAPPIEST PART OF THE BOOK?

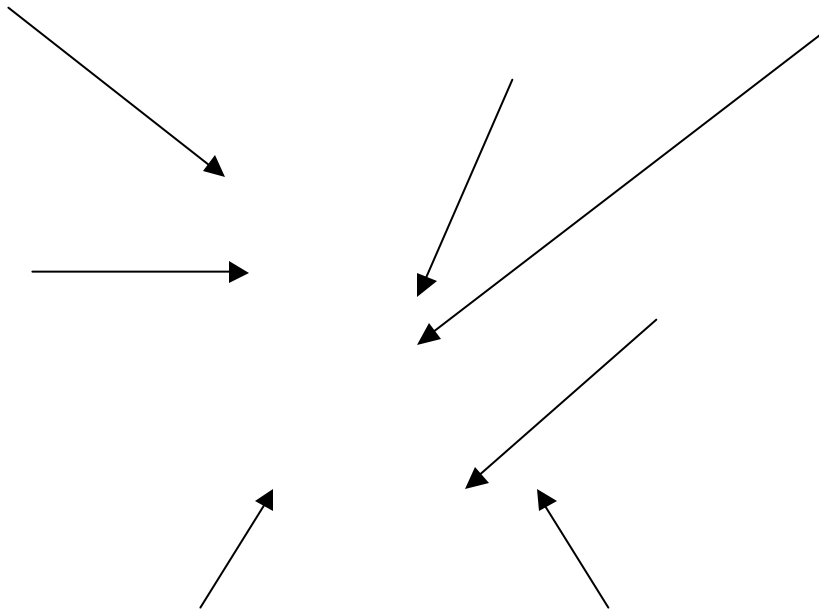
5. NAME ONE STATE THAT JOHNNY TRAVELED THROUGH ?

PARTS OF THE FLOWER –Worksheet C

VOCABULARY

1. Anther
2. Filament
3. Petal
4. Sepal
5. Ovary
6. Style
7. Stigma

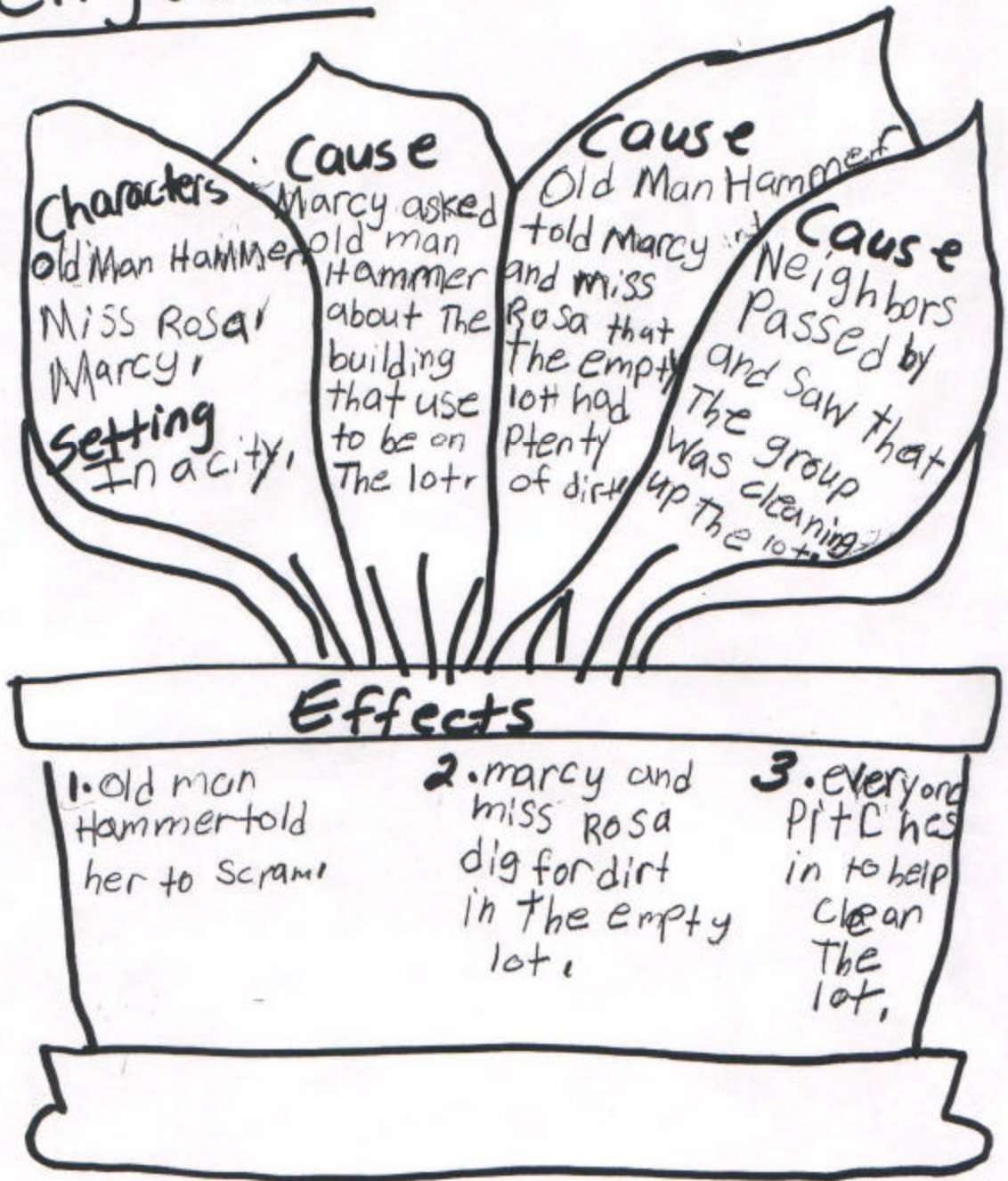
THE FLOWER- Draw a flower and name the parts.



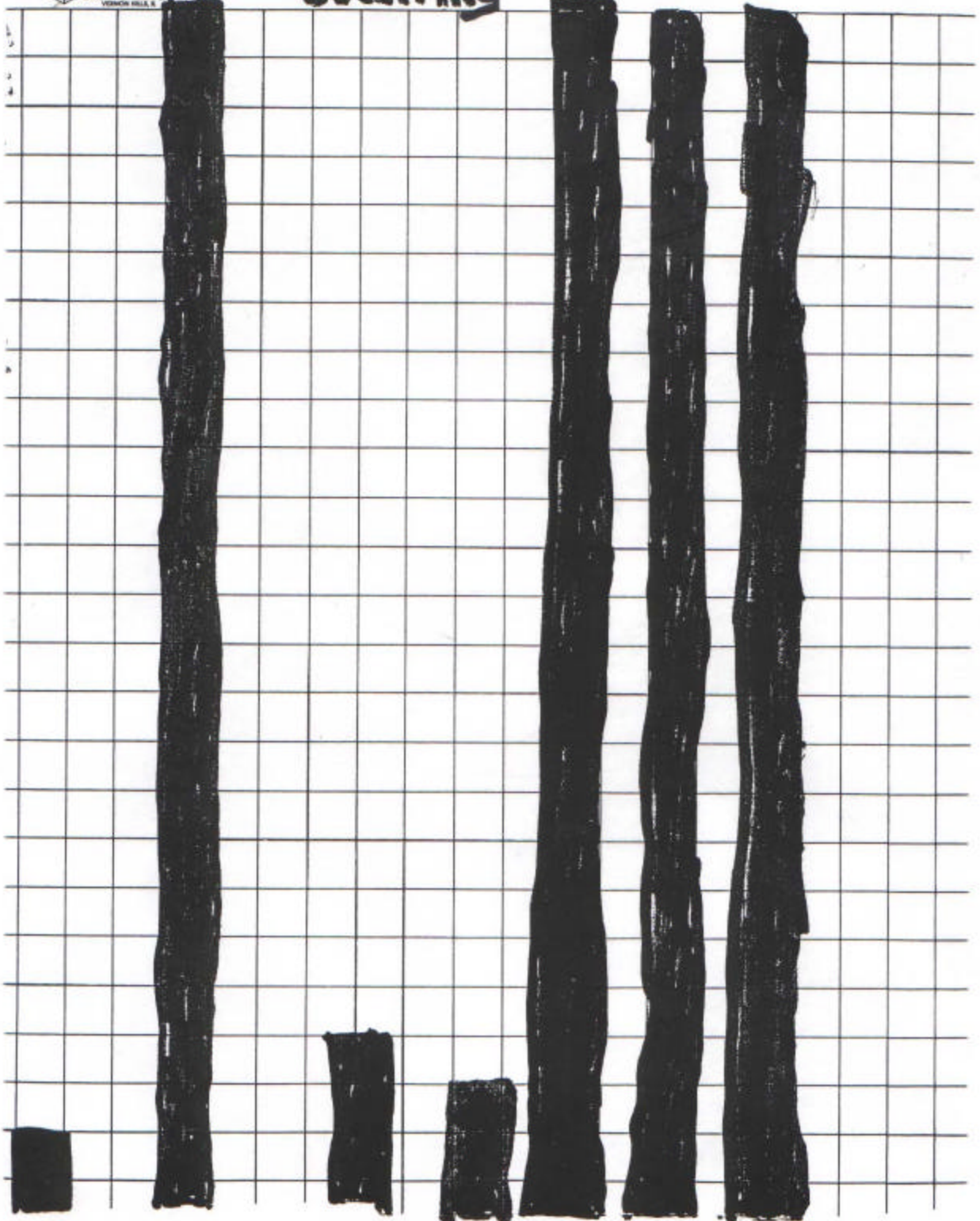
Examine your flower, count the parts, and place the numbers below.

Sepal		Petal		Stamen		Carpel			

City Green











- Counting

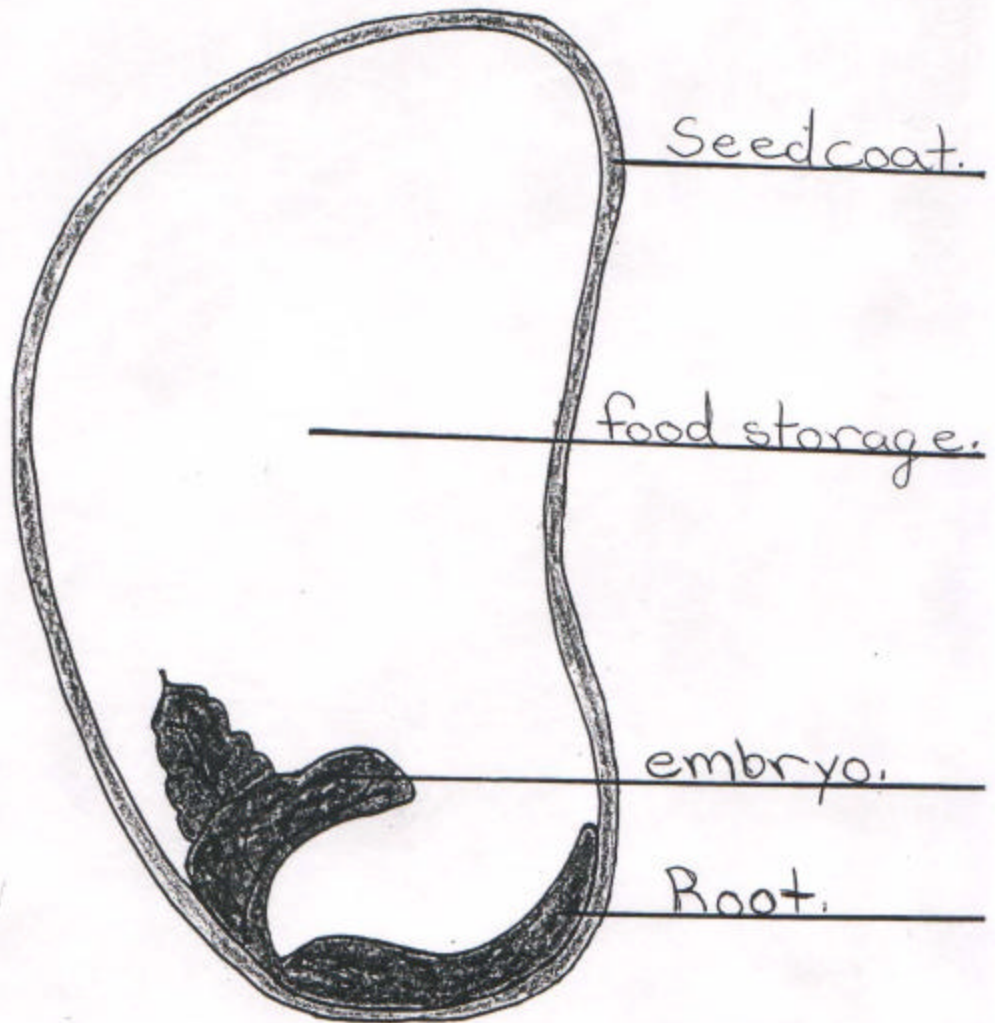


AVOCADO cucumber orange apple melon tomato green pepper peach

3. Look ahead at the fruits and vegetables. 2. Draw them. You find the seeds. 3. Carefully count the seeds and shape of seeds.

<p>Avocado</p>  <p># of seeds: 1 shape of seeds: 0</p>	<p>Cucumber</p>  <p># of seeds: 140 shape of seeds: 1</p>	<p>Orange</p>  <p># of seeds: 3 shape of seeds: 0</p>	<p>Apple</p>  <p># of seeds: 2 shape of seeds: 0</p>
<p>Melon</p>  <p># of seeds: 104 shape of seeds: 0</p>	<p>Tomato</p>  <p># of seeds: 14 shape of seeds: 0</p>	<p>Green Pepper</p>  <p># of seeds: 8 shape of seeds: 1</p>	<p>Peach</p>  <p># of seeds: 1 shape of seeds: 8</p>

Parts Of A Seed



Inside a bean



Dry bean



Soaked bean



City Green Worksheet

Problem

1. There is a ugly vacant dirty lot.
2. old man Hammer has a attitude.
3. The lot is owned by the city.
4. There was an old building.



Solution

1. They cleaned the lot and decided to plant a garde.
2. He decided to plant his own seeds Do not incude him.
3. we will rent the property frome The city.
4. Destroy othe building.



Resources

Publications:

Grow Lab: Activities for Growing Minds National Gardening Association, 1997

Primary Plants c. 1990 AIMS Education Foundation.

Plants Thematic Units #244 c. Teacher Created Materials, Inc. 1995

Plants 1995 Teacher Created Materials, Schoolzone Publishing Co.

Science Addison Wesley Publications Company, Inc., 1992

Science Made Simple Frank Schaeffer Publications, Inc.

September Monthly Activities #151, c. Teacher Created Materials, Inc.

Organizations:

The New York Botanical Garden: Bronx, New York.

This organization has workshops for teachers and day programs for students.

Videos:

The Magic School Bus Goes to Seed, Scholastic Inc., Time Warner Entertainment, 2000.

The Magic School Bus Gets Planted, Scholastic Inc., Time Warner Entertainment, 2000.

Plants of the Rainforest, Rainforest for Children Series., Schlesinger Video Productions.



Web Sites:

www.Kidgardening.com

www.nj.com/yucky/worm

www.sambal.co.uk

photosynthesis.html

www.ed.gov/pubs/parents/science/plants.html

www.education-world.com/alessons

www.sciencemadesimple.com/leaves/html

www.atozteacherstuff.com/lessons

www.mnh.si.edu/garden/welcomehtml

www.nybg.org

www.encarta.com



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