

Aaron Brown

# Research Studies In Environmental Science

*Carbon Teaching Experiment*  
*"Plants Growth and Gas Exchange"*

Student Activity Pages

SY 2012-2013

February 2013- April 2013

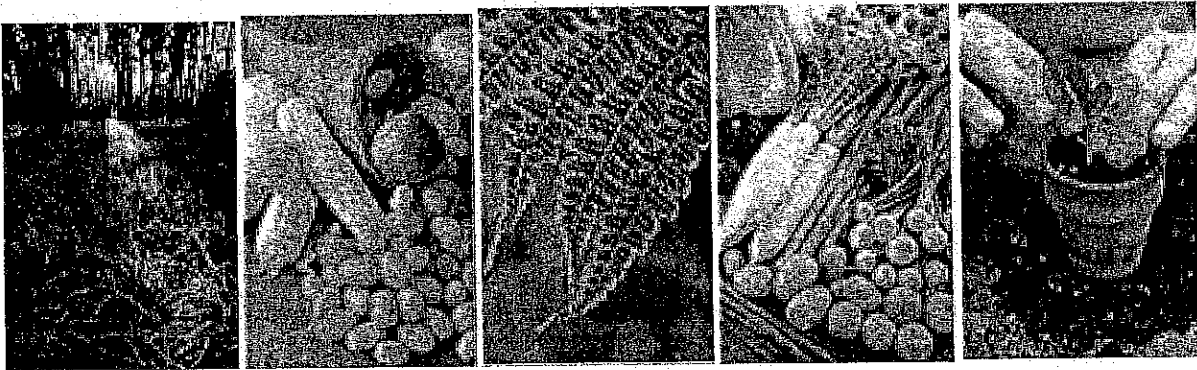
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# PLANT GROWTH AND GAS EXCHANGE

## STUDENT ACTIVITY PAGES



*Culturally relevant ecology, learning progressions and environmental literacy*

*Environmental Literacy Project*

*<http://edr1.educ.msu.edu/EnvironmentalLit/index.htm>*

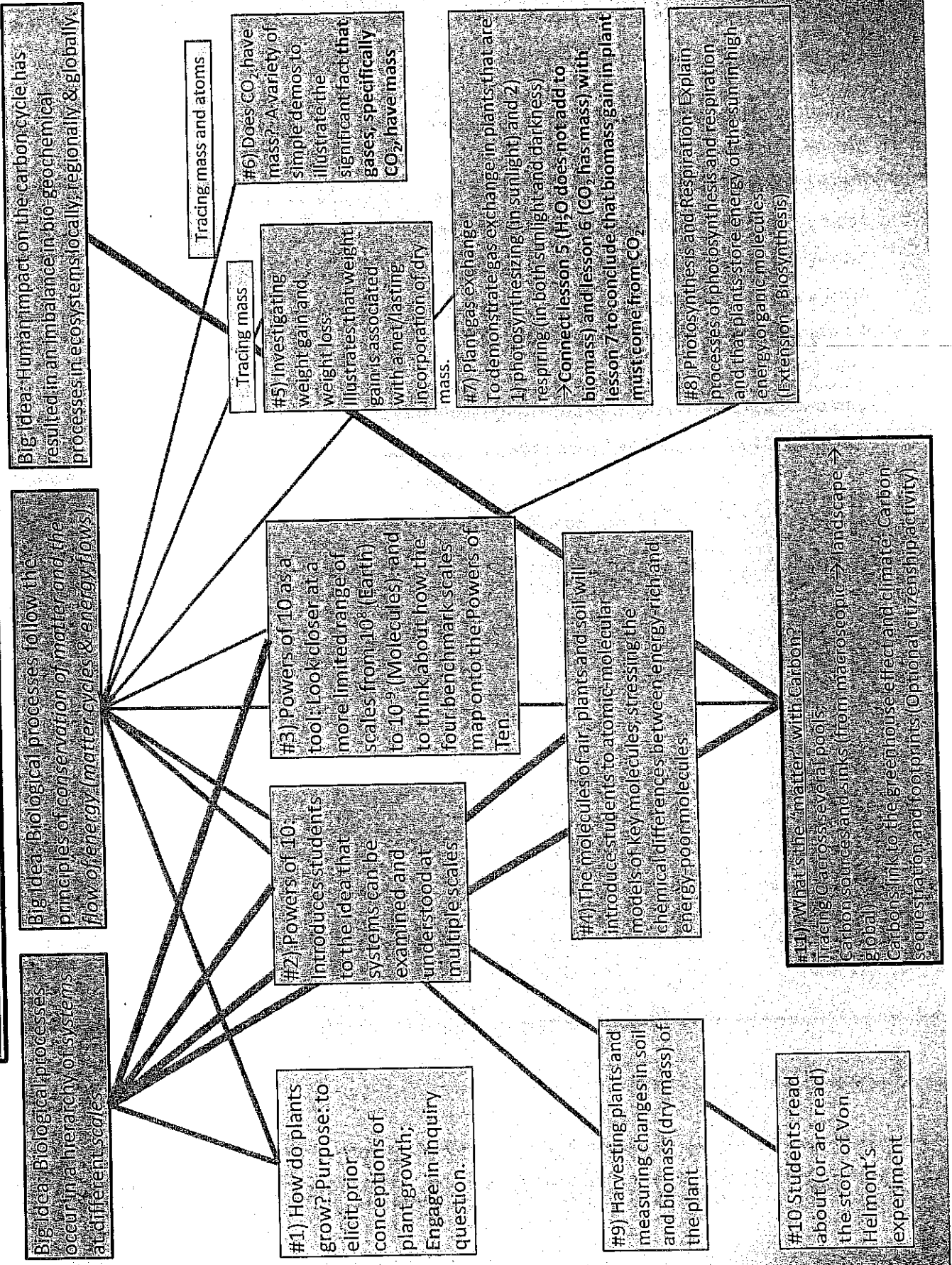
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With help from Cheryl Hach, Becky Drayton, Dante Cisterna, Michele Johnson, Lisa Pitot, and Lori  
Spindler*

*October, 2010*

*Revised, September 2011*

Development of these materials is supported by a grant from the National Science Foundation: Targeted Partnership: Culturally relevant ecology, learning progressions and environmental literacy (NSF-0832173), with additional support from Developing a Research-based Learning Progression for the Role of Carbon in Environmental Systems (REC 0529636), Learning Progression on Carbon-Transforming Processes in Socio-Ecological Systems (NSF 0815993), and the Great Lakes Bioenergy Research Center. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation or the Department of Energy.

# What's the Matter with Carbon?



Name: A.B. Period: \_\_\_\_\_ Date: \_\_\_\_\_

### Activity 1: How Do Plants Grow?

Large plants can grow from small seeds into large trees. What do you think a plant needs to grow?

Nutrients such as water, air, sunlight and food are the necessities for the means of the plant to grow.

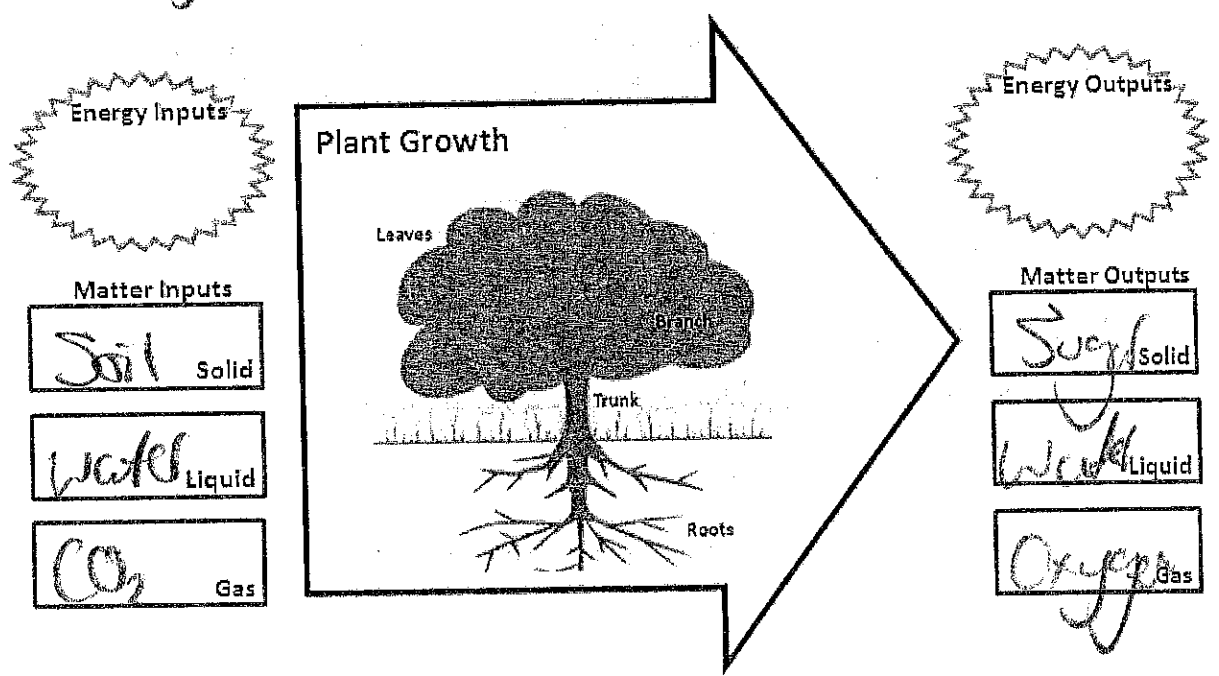
What evidence can you use from your own previous experiences that plants need these things?

Water plants, knowing they need water and also knowing that is what causes the chemical reaction.

How do you think that plants use the things they need in order to grow?

We need water to survive and we are also living so they require the same. Just that sunlight and air too.

Use the matter and energy process tool below to illustrate your thoughts about what plants need to grow:



8. Water the growing containers carefully, according to your teacher's directions.
9. Place your cup in the light near a window, if possible.

**Beans or Peas**

10. Follow the same steps for bean/pea seeds as for lettuce/radish seeds. Use the table below to record data about your bean seeds.

Beans: Cup Number _____			
	Mass of:	Before growing (Lesson 1)	After growing and drying (Do later: Lesson 9)
A	cup		13.72
B	cup + soil		
C	soil (subtract B - A)		
D	seeds		
E	cup + soil + seeds		
	<b>number of seeds</b>		

11. Water the seeds as you did for the lettuce and place the cup in the growing area.

**Track the progress of your seeds**

You will need to monitor your plants to track their progress and add water as necessary. You should check your plants every day and fill out the following data table (or something similar) about every 2-3 days. You should note the general health and growth patterns of the plants: Have all survived? Are all producing healthy green leaves? and so forth. Make sure to make complete and accurate notes to describe your plants.

Date	3/13	3/15	4/13	4/15	4/20	4/25	5/1
Lettuce: number of shoots	0	0	2	2	3	3	4
Lettuce Observations							
Beans: number of shoots	2/15	5/15	5/15	6/15	7/15	7/15	5/15
Additional Observations:	Sprouts	very small stem	Taller than before	Starting to die and the long	Varying green too long	one sprout's shoot died	all 5 starting to die.

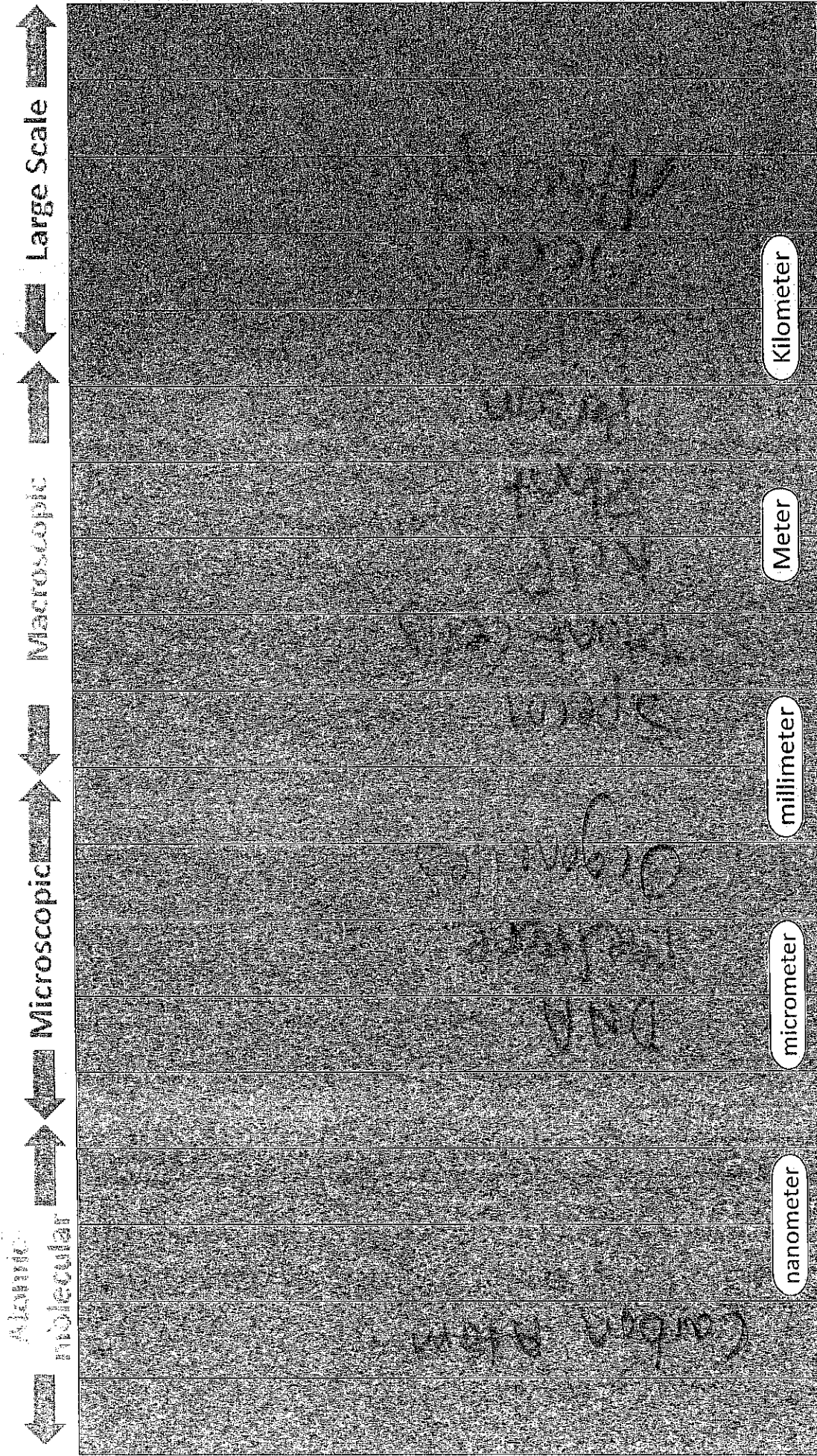
You may watch the Powers of Ten video again. However, this time your teacher will pause the video at each scale, and you will need to think about what appears and disappears when you zoom in or out. You will need to complete the table below, and as you watch the video again, think about the size of different systems and if they match the groups you made on the first page.

What You See When You Zoom In	Starting Point: What You See	What You See When You Zoom Out
$10^0$	City Park	$10^0$
$10^1$	Chicago	$10^1$
$10^4$	United States	$10^4$
$10^7$	Solar System	$10^7$
$10^{14}$	Galaxy	$10^{14}$
$10^{-1}$	Hand	N/A
$10^{-3}$	Skin	N/A
$10^{-4}$	Capillaries	N/A
$10^{-6}$	DNA molecule	N/A
$10^{-9}$	Carbon Atom	N/A

After watching the video again, is there anything you would change from your groups on the first page?

Bees Head -  $10^{-2}$   
 Bees Eye -  $10^{-3}$   
 Bacteria -  $10^{-5}$   
 Virus -  $10^{-7}$   
 Pollen -  $10^{-4}$   
 Cali -  $10^6$   
 SF Bay -  $10^5$   
 JTG -  $10^2$

# Powers of Ten



Smaller  $10^{-10}$   $10^{-9}$   $10^{-8}$   $10^{-7}$   $10^{-6}$   $10^{-5}$   $10^{-4}$   $10^{-3}$   $10^{-2}$   $10^{-1}$   $10^0$   $10^1$   $10^2$   $10^3$   $10^4$   $10^5$  Larger

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

## Activity 5: Investigating Weight Gain and Weight Loss

### First Questions about Gaining and Losing Weight

We all know that people can eat food and gain weight, and that plants can grow and gain weight. But what does it REALLY mean to gain weight? Try filling out the table below.

When you add water to a sponge, does it gain weight?	<input checked="" type="radio"/> Yes <input type="radio"/> No	Explain your answer The sponge's mass increases
When you drink a cup of water, do you gain weight?	<input checked="" type="radio"/> Yes <input type="radio"/> No	Explain your answer You absorb the water as mass. It's possible to not gain weight though.
When a plant grows in the sunlight, does it gain weight?	<input checked="" type="radio"/> Yes <input checked="" type="radio"/> No	Explain your answer The mass doesn't increase, uses water and sun to make glucose
What measurements do you need to make to determine if a plant has gained weight? Measure it's mass before and after a period of growth The leaves growing and how much it grew in height and in the leaves		

### Does water make materials gain weight?

#### Materials:

- 1 plastic cup
- 1 dry sponge or small amount of dried vermiculite
- Tap or distilled water
- 1 small digital balance (300-g capacity)

#### What to do:

This will be a two-day experiment.

- On the first day, you will **predict and measure the mass of the sponge or vermiculite** before and after you add water. This means you will:
  - **Weigh** the dry sponge or vermiculite.
  - **Weigh** a cup, then add some water and weigh the cup filled with water.
  - Figure out the **weight of just the water**. How can you do that?
  - **Predict the weight** of moist material after it soaks up the water.
  - **Weigh** the moist material to see how well you predicted.
- Your teacher will dry out the material overnight
- On the second day, you will **predict and measure the mass of the dried material**.



## Do Plants Gain Mass When You Water Them?

### Materials

- 1 small digital balance (300-g capacity)
- Plant that you are growing
- Small plastic cup
- Water

### What to do:

- **Weigh** your plant in its cup on the digital balance.
- **Weigh** the cup, then add some water and **weigh** the cup with water.
- **Figure out the weight** of just the water. How can you do that?
- **Predict the weight** of your plant after you have watered it.
- **Weigh** your plant to see how well you predicted.

You can use the table below to record your predictions and measurements

Mass of your plant in its cup:	Mass of empty water cup:	Mass of cup with water added:	Mass of just the water:
Your prediction: What will your plant weigh after it is watered?	Reason for your prediction:		Actual measurement: What mass did you measure?

1. What do you think might happen to the mass of your plant in its cup overnight? Why?
2. Do you think your plant REALLY gained weight when you watered it? Explain your reasoning.

Use the mass tracing process tools to trace the masses for the student and your plant.

