



# The Magic of Plants

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“One day things weren’t there and another they were. I had never watched things before and it made me feel very curious. Scientific people are always curious. I am going to be scientific.”

*-The Secret Garden*

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Have you ever wondered how plants grow? I have, too! Turns out we aren’t the only ones who have wondered this marvelous thought. There are many people in the world who have done scientific experiments on plants to figure out how they grow. There are also kids just like you who have come up with their own ideas as to how plants grow. Let’s take a look at what one curious child has to say on the matter...

“‘What is it? What is it?’ It’s something. It can’t be nothing! I don’t know its name so I call it magic.”

*-The Secret Garden*

What do you think makes plants grow? Is it magic? How does this magic come to be? Let’s find out! It’s time for you to adventure, become scientists, and do your own experiments on plants to see how they grow best. There are 3 different experiments included as separate PDFs in this activity. You can do any or all of the experiments! There is also an “Experiment Sheet” as a separate PDF to keep track of information while doing each experiment. Be sure to read the “Reflection” PDF once you are finished experimenting, too. Before you start experimenting, there are a few things you need to know about the scientific process. Are you ready to begin? Let’s go!

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# The Scientific Process

In order to perform successful experiments, scientists need to follow certain steps. There are 6 steps that you will follow in your experiment. Let's see what they are!

## 1. Make a Hypothesis

First, scientists must come up with a hypothesis. A hypothesis is an explanation, or a guess, of what the scientist thinks the result of their experiment will be. They are usually formed using "if, then" statements.

For example, if I am trying to test which kind of shoes (flip flops, sneakers, or boots) make someone run faster, and I think sneakers will, my hypothesis is "If people wear sneakers, then they will run faster."



Don't be like this dude!!

## 2. Determine Materials

Scientists need to make sure they have everything they need to perform their experiment.

For the running experiment, my materials include sneakers, flip flops, boots, a tape measure, a stopwatch, and a person to run.

## 3. Determine the Independent Variable

The independent variable is what scientists are testing or changing in their experiment.

The independent variable in the running experiment is the type of shoes because they will change in each trial of the experiment in order to see the running time differences.

## 4. Determine the Controlled Variables

The controlled variables are the elements of the experiment that will not be changed. This ensures that the results of the experiment aren't influenced by any elements other than the independent variable.

In the running experiment, the controlled variables are the person running and the distance they are running because they will stay the same in each trial of the experiment.

### **5. Determine a Method to Measure Change**

In order to see how the independent variable affects what scientists are testing, they need to have a way to measure what they are testing. They will also have to write down the measurements.

For the running experiment, I will measure the time it takes for the person to run a certain distance in each type of shoe and write those times down on my "Experiment Sheet."

### **6. Come to a Conclusion**

Once scientists have all of the measurements from their experiment, they can come to a conclusion, or a decision, about their experiment and answer their hypothesis.

For the running experiment, if the person is able to run the shortest amount of time in sneakers, I can conclude that sneakers are the best shoes to run in.

Let's see how these steps apply to your experiment(s)!

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## Experiment 1 (Light)

In this experiment, you will test the effects light has on plant growth. Before starting, ask yourself some questions. Do you think plants will grow taller in partial light? In constant light? Without any light? Let's find out! In this experiment, you will test how plants grow in partial light, constant light, and no light using cress plants.

### **Make a Hypothesis**

Consider which of the three light conditions you think the plant will grow the tallest in. Once you have a guess, form your hypothesis! Write your hypothesis down on the "Experiment Sheet."

### **Determine Materials**

For this experiment, you will need...

- Container with lid
- 3 cups (you can use drinking cups, egg cartons, solo cups... just whatever you have)
- Cress seeds (or another type of seed)
- Soil (it can even be from your own backyard)
- Spray bottle
- Water
- Lamp
- Windowsill
- Dark place
- Ruler

### **Determine the Independent Variable**

The independent variable in this experiment is the amount of light because it is the variable you are changing to see how it affects plant growth.

### **Determine the Controlled Variables**

The controlled variables are the amount of water and type of soil that each cup gets because they will be the same for each cup.

### **Determine a Method to Measure Change**

You will measure the heights of each plant everyday using a ruler and record the tallest heights in inches on the "Experiment Sheet."

### **Come to a Conclusion**

The tallest plant at the end of the experiment is the one in the best light condition.

Here are the steps you will follow for **Experiment 1!**

## The Steps for Experiment 1

1. Place 9 seeds in a clean container and cover them with room temperature water. Let them sit overnight.
2. After the seeds have sat overnight, fill each cup  $\frac{3}{4}$  full with the same soil. Plant 3 seeds into each cup.
3. Place one cup on a windowsill, another in front of a turned-on lamp, and the last in a dark place.
4. Fill the spray bottle with water.
5. Using the spray bottle, spray each cup with 3 squirts of water from the bottle.
6. Measure the height of each plant with the ruler. Write down the height in inches of the tallest plant in each cup on the "Experiment Sheet." Make sure you label each type of plant condition above the measurements on the "Experiment Sheet." The different columns should be labeled constant light, partial light, and no light.
7. Repeat steps 5 and 6 for 10 days.
8. Once 10 days are over, determine which cup has the tallest plant. This is the best light condition for your plant! Good work, scientist!



## Experiment 2 (Water)

In this experiment you will test the effects water has on plant growth. Before starting, ask yourself some questions. Do you think plants will grow taller with a lot of water? With a little bit of water? With no water? Let's find out! In this experiment, you will test how plants grow with lots of water, with little water, and with no water using cress plants.

### **Make a Hypothesis**

Consider which of the three water conditions you think the plant will grow the tallest in. Once you have a guess, form your hypothesis! Write your hypothesis down on the "Experiment Sheet."

### **Determine Materials**

For this experiment, you will need...

- Container with lid
- 3 cups (you can use drinking cups, egg cartons, solo cups... just whatever you have)
- Cress seeds (or another type of seed)
- Soil (it can even be from your own backyard)
- Spray bottle
- Water
- Windowsill
- Ruler

### **Determine the Independent Variable**

The independent variable in this experiment is the amount of water because it is the variable you are changing to see how it affects plant growth.

### **Determine the Controlled Variables**

The controlled variables are the amount of light and type of soil that each cup gets because they will be the same for each cup.

### **Determine a Method to Measure Change**

You will measure the heights of each plant everyday using a ruler and record the tallest heights in inches on the "Experiment Sheet."

### **Come to a Conclusion**

The tallest plant at the end of the experiment is the one in the best water condition.

Here are the steps you will follow for **Experiment 2!**



## Steps for Experiment 2

1. Place 9 seeds in a clean container and cover them with room temperature water. Let them sit overnight.
2. After the seeds have sat overnight, fill each cup  $\frac{3}{4}$  full with the same soil. Plant 3 seeds into each cup.
3. Place the cups on the windowsill.
4. Fill the spray bottle with water.
5. Using the spray bottle, spray one cup with 10 squirts of water, spray another cup with 3 squirts of water, and do not spray the final cup with any squirts water.
6. Measure the height of each plant with the ruler. Write down the height in inches of the tallest plant in each cup on the "Experiment Sheet." Make sure you label each type of plant condition above the measurements on the "Experiment Sheet." The different columns should be labeled 10 squirts of water, 3 squirts of water, and no water.
7. Repeat steps 5 and 6 for 10 days. Make sure you keep track of which cups get 10 squirts, 3 squirts, and no squirts. Labeling the cups can help.
8. Once 10 days are over, determine which cup has the tallest plant. This is the best water condition for your plant! Good work, scientist!



## Experiment 3 (Soil)

In this experiment you will test the effects the type of soil has on plant growth. Before starting, ask yourself some questions. Do you think plants will grow taller in dirt? In sand? In pebbles? Let's find out! In this experiment, you will test how plants grow in dirt, in sand, and in pebbles using cress plants.

### **Make a Hypothesis**

Consider which of the three soil conditions you think the plant will grow the tallest in. Once you have a guess, form your hypothesis! Write your hypothesis down on the "Experiment Sheet."

### **Determine Materials**

- Container with lid
- 3 cups (you can use drinking cups, egg cartons, solo cups... just whatever you have)
- Cress seeds (or another type of seed)
- Dirt (it can even be from your own backyard)
- Sand
- Pebbles
- Spray Bottle
- Water
- Windowsill
- Ruler

### **Determine the Independent Variable**

The independent variable in this experiment is the type of soil because it is the variable you are changing to see how it affects plant growth.

### **Determine the Controlled Variables**

The controlled variables are the amount of light and water that each cup gets because they will be the same for each cup.

### **Determine a Method Measure Change**

You will measure the heights of each plant everyday using a ruler and record the tallest heights in inches on the "Experiment Sheet."

### **Come to a Conclusion**

The tallest plant at the end of the experiment is the one in the best soil condition.

Here are the steps you will follow for **Experiment 3!**

## Steps for Experiment 3

1. Place 9 seeds in a clean container and cover them with room temperature water. Let them sit overnight.
2. Fill one cup  $\frac{3}{4}$  full with dirt, another  $\frac{3}{4}$  full with sand, and the last  $\frac{3}{4}$  full with pebbles. Plant 3 seeds into each cup.
3. Place the cups on the windowsill.
4. Fill the spray bottle with water.
5. Using the spray bottle, spray each cup with 3 squirts of water from the bottle.
6. Measure the height of each plant with the ruler. Write down the height in inches of the tallest plant in each cup on the "Experiment Sheet." Make sure you label each type of plant condition above the measurements on the "Experiment Sheet." The different columns should be labeled dirt, sand, and pebbles.
7. Repeat steps 5 and 6 for 10 days.
8. Once 10 days are over, determine which cup has the tallest plant. This is the best soil condition for your plant! Good work, scientist!



# Experiment Sheet

\*fill out for each experiment

## Hypothesis

If the plant grows in \_\_\_\_\_,  
then it will grow the tallest.

## Measurements

*make sure you write down the different conditions in each spot! -->	Plant _____ _____ _____ height in inches	Plant _____ _____ _____ height in inches	Plant _____ _____ _____ height in inches
Day 1	in.	in.	in.
Day 2	in.	in.	in.
Day 3	in.	in.	in.
Day 4	in.	in.	in.
Day 5	in.	in.	in.
Day 6	in.	in.	in.
Day 7	in.	in.	in.
Day 8	in.	in.	in.
Day 9	in.	in.	in.
Day 10	in.	in.	in.

## Conclusion

The best condition for the plant to grow in  
is \_\_\_\_\_

## Read Once You Are Done Experimenting!

Now that you are done experimenting, it's time to reflect and ask yourself some questions.

### **What did you learn?**

You certainly learned the best ways to take care of plants. **Was there anything else you learned? How did you feel when you were taking care of the plants? Did taking care of the plants make you happy?**

I hope it did! Learning to care for plants is such an important skill. In the book *The Secret Garden*, the main characters Colin and Mary also learned how important gardening was and taking care of the plants made them happy.

When you take care of plants, they can take care of you, too, by giving you joy that you can carry with you for the rest of your life. There is something quite magical about taking care of plants. I hope you are able to discover more of this magic in the future by taking care of other things!

## Works Cited

Cress Seedlings from: “How to Grow Cress.” *Harvest to Table*,

[harvesttotable.com/how\\_to\\_grow\\_cress/](http://harvesttotable.com/how_to_grow_cress/). Accessed 15 Nov 2020.

Kid Botanists from: “NATUREKID TO-GO KIT: KID SCIENTIST.” *Norfolk Botanical Garden*,

[norfolkbotanicalgarden.org/events/naturekid-to-go-kit-kid-scientist/](http://norfolkbotanicalgarden.org/events/naturekid-to-go-kit-kid-scientist/). Accessed 15 Nov

2020.

Kid Scientists from: “Adobe Stock.” *Adobe*,

[stock.adobe.com/gr\\_en/search/images?k=kid+scientist+cartoon](http://stock.adobe.com/gr_en/search/images?k=kid+scientist+cartoon). Accessed 15 Nov

2020.

Mad Scientist from: “Mad Scientist.” *Wikipedia, The Free Encyclopedia*,

[en.wikipedia.org/wiki/Mad\\_scientist](http://en.wikipedia.org/wiki/Mad_scientist). Accessed 15 Nov 2020.

Plant Experiment from: “Science Clip Art Images Clipart - Science Plant Clipart.” *SeekPNG*,

[www.seekpng.com/ipng/u2y3a9q8r5t4q8i1\\_science-clip-art-images-clipart-science-plant-](http://www.seekpng.com/ipng/u2y3a9q8r5t4q8i1_science-clip-art-images-clipart-science-plant-clipart/)

[clipart/](http://www.seekpng.com/ipng/u2y3a9q8r5t4q8i1_science-clip-art-images-clipart-science-plant-clipart/). Accessed 15 Nov 2020.