# Stomata Density

Alexis Bell
Butler Elementary
March 16, 2026

**Question/Problem:**

Does plant growing conditions (Sun VS. Shade) affect the # of stomata density?

**Research Question 1:**
What is the basic biological structure and function of stomata density on plants leaves,including their primary role in regulating gas exchange and transpiration?

The answer is that the basic biological structure and function of stomata in plant leaves, including their primary role in regulating gas exchange and transpiration is  to let the plant ‘’breathe’’in carbon dioxide for photosynthesis and to let out oxygen, a waste product.

**Research Question 2:**
What are the specific environmental factors,focusing on light intensity ( sunlight vs. shade), that are scientifically known to influence the development  process that determines stomata density?

The answer to this question is it directly impacts a plants ability to perform gas exchange affecting its photosynthesis, water loss and overall productivity.

**Research Question 3:**

What are the physiological mechanisms and signaling pathways by which varying light conditions trigger changes in the number or density of stomata during leaf formation?

The answer to this question is influencing key proteins and signaling molecules like **HY5, STOMAGEN,** and **SPCH.**

**Research Question 4:**

What are the functional consequences of having higher versus lower stomatal density on a plant's rates of photosynthesis, carbon uptake, and water use efficiency?

Have more stomata on a plant's leaves means it can do more photosynthesis and take up more carbon dioxide for faster growth but it also loses more water and is less water efficient.

**Research Question 5:**

What are the  reliable, simple methods typically used by scientists (and applicable to a classroom setting) to accurately count and calculate stomatal density on a leaf surface?

A reliable and simple method for counting stomatal density involves creating a clear nail polish "peel" of the leaf's underside, then attaching the peeled impression to a slide with clear tape to view under a microscope. Kids can count the stomata in a specific area of the field of view and use the area of the field of view to calculate the density in a specific unit, like stomata per square millimeter (mm2m m squared mm2).

# Alternative Hypothesis:

If plant growing conditions are different (sun vs. shade) then the numbers of the stomata density will increase / decrease because they need to maximize carbon dioxide intake for photosynthesis in bright conditions.

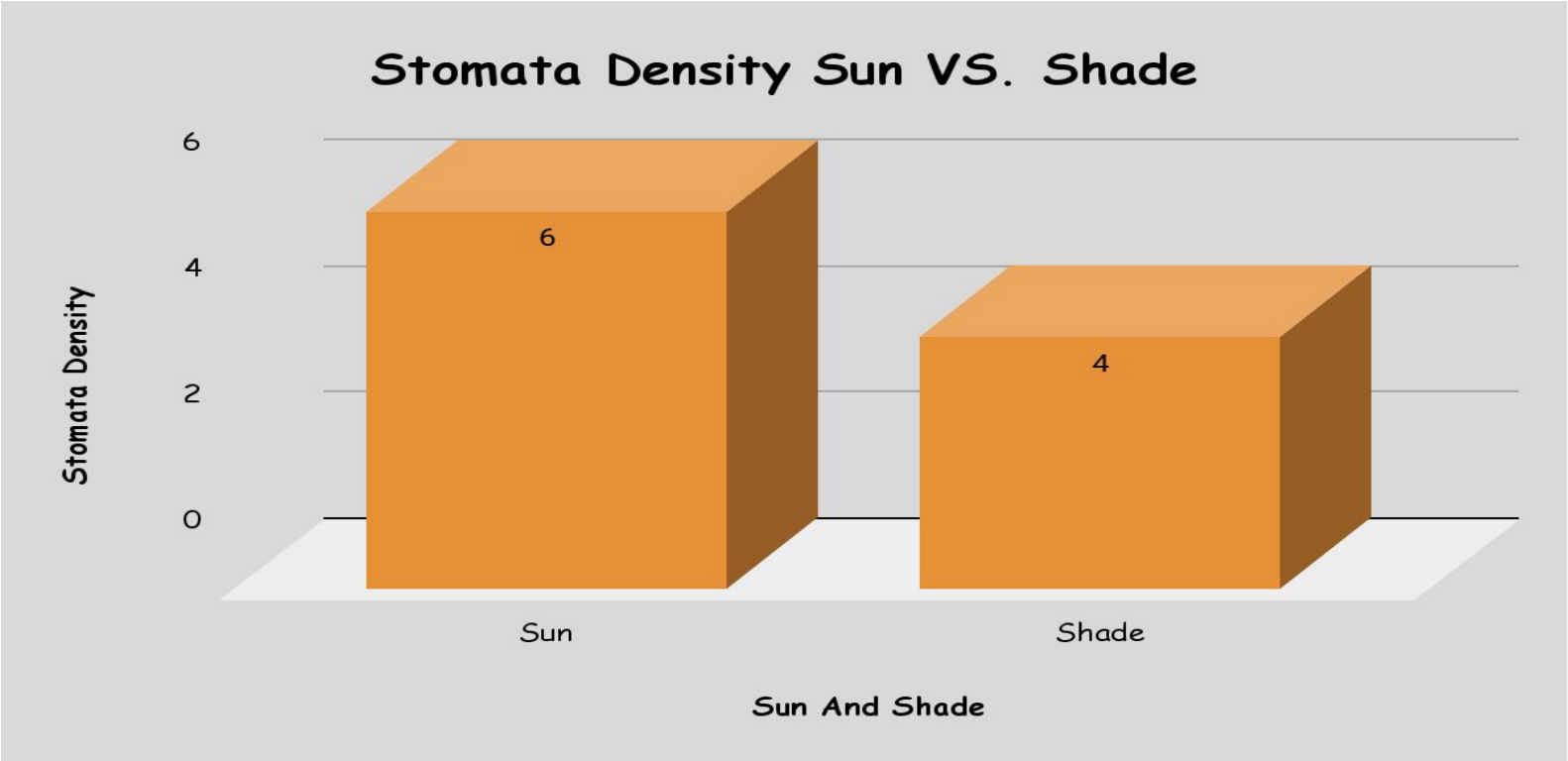
# Null Hypothesis:

If plant growing conditions are different (sun vs. shade) then there will be no change to the stomata density because due to other interacting factors, such as water availability or the specific species adaptation strategy.

# PROCEDURE:

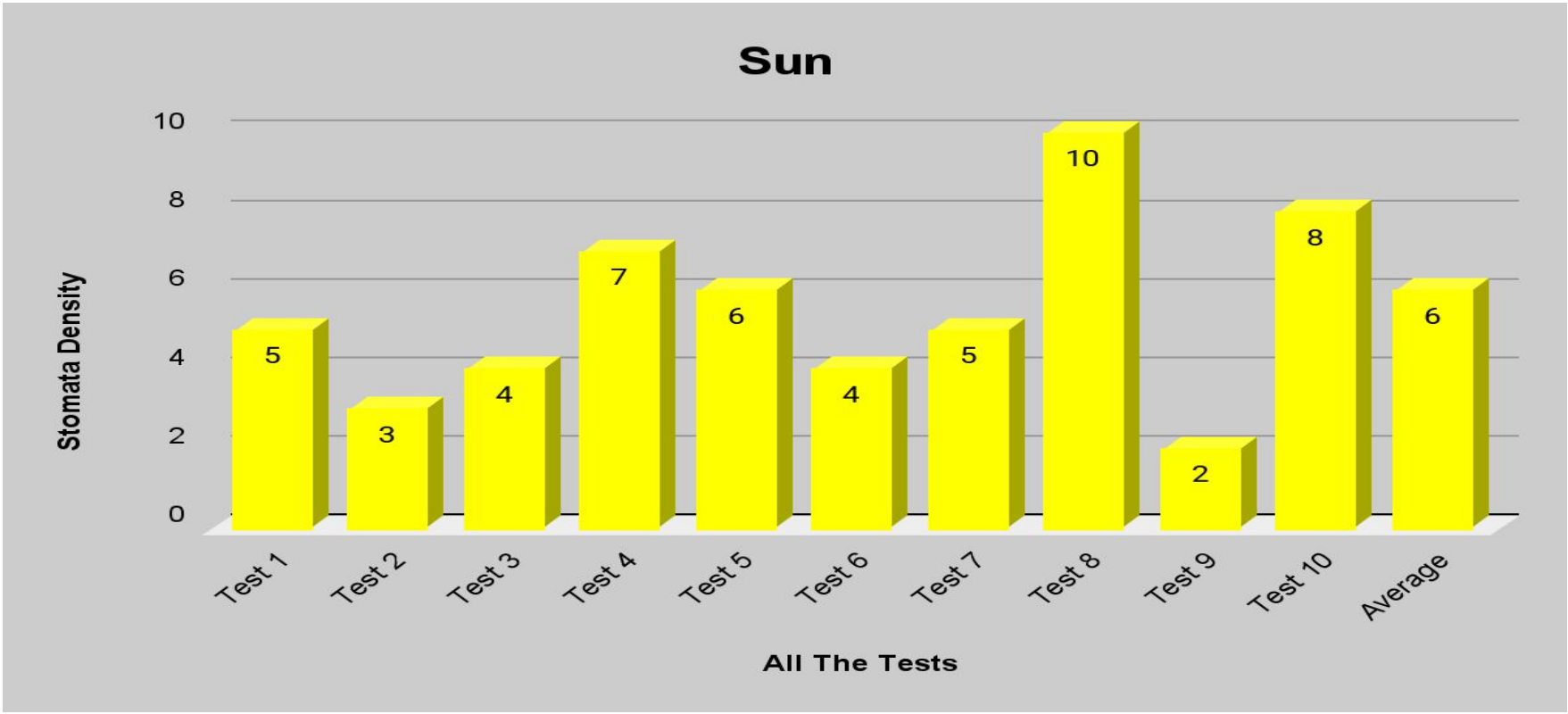
1. Label 10 cups with sun and 10 with shade
2. ½ cups of soil in each cup
3. Plant 2 seeds in ¼ deep in each cup
4. Give each plant 1 tablespoon of water
5. Then put 10 cups in the sun and 10 in the shade
6. Then repeat #4 for 6 weeks
7. After 6 weeks, Record and measure the stomata density on each of the plant
8. Put a thin layer of clean fingernail polish on the back of the plants leaves on all 20 of them
9. Peel the finger nail polish off
10. Put the peel of the finger nail polish on the glass slide
11. Then look for all the stomata density under the microscope

# ANALYZE DATA:



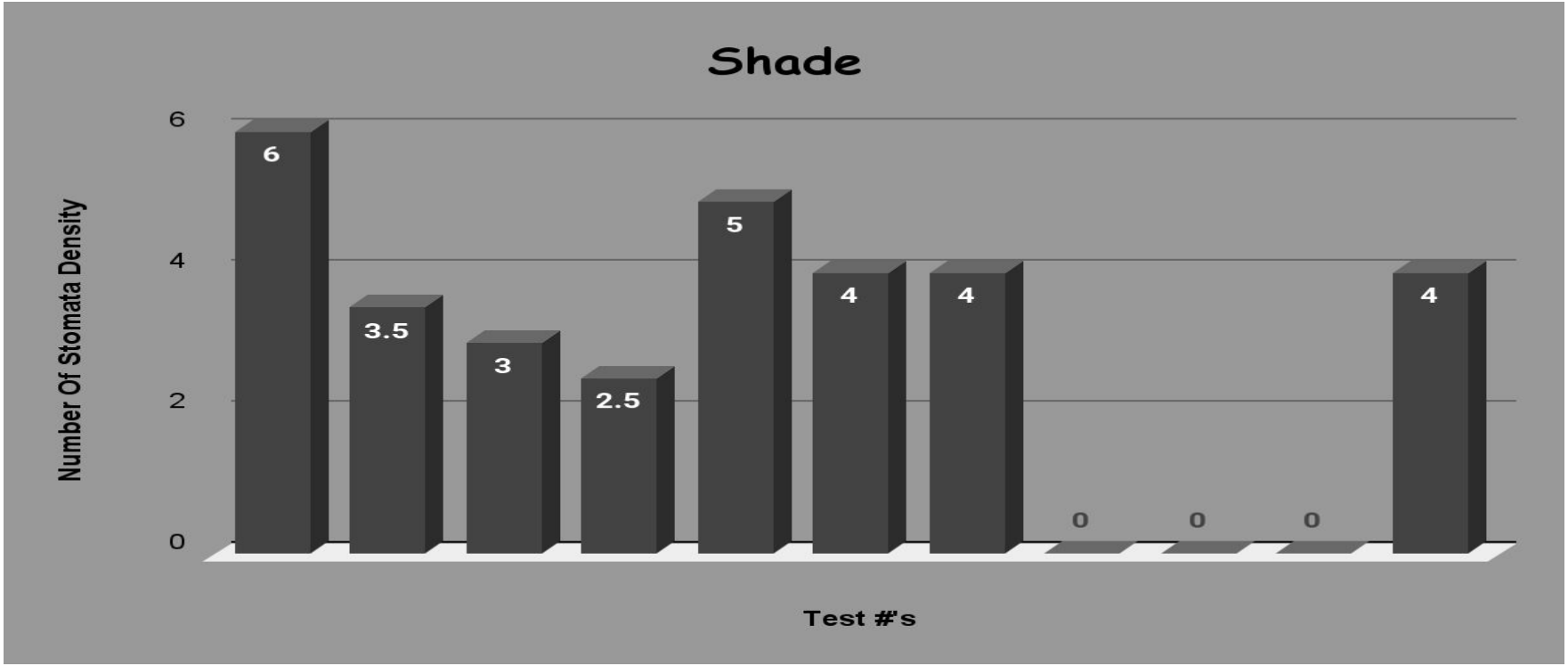

**On the above graph it shows the stomata density average for both sun and shade. There is more stomata density in the sun leaves instead of the shades leaves.**

# ANALYZE DATA:




**On the above graph it shows the stomata density for the 10 plants that sat in the sun for 6 weeks. The stomata density for the plants average is 6.**

# ANALYZE DATA:




**On the above graph it shows the stomata density for the 10 plants that sat in the shade for 6 weeks. The stomata density for the plants average is 4.**

# CONCLUSION:

My null hypothesis was wrong because my average stomata densities are completely different from each other and are/is incorrect. But my alternative hypothesis is correct because my stomata densities are different from each other and they did increase/ decrease because of the carbon dioxide.I did my data the way I did because I grew all twenty plants in the start/middle of January so that's why my data turned out the way it did so there wasn't enough time to grow the plants till they were huge so I did it while it was still small so I didn't fall behind in all my science fair work.

If I had to do this experiment first I would start sooner and I would water it with more water it was mostly dry or like chalky a lot and there wasn't a lot of time to change the amount of water I was doing we were to far into the project so I would change how much water I gave it and I would definitely not do radish like I did and instead I would do a flower or a different veggie I wouldn't do radish unless you need to get it done in like 2 or 3 weeks.

You could use this stuff in real life because if you want to learn about plant stomata density or like it helps if you want to learn how to see those types of things under a microscope and it's pretty cool to look at under a microscope. A couple observations that I made when I was doing my project where the plants leaves can be so many different shapes and sizes so I thought that was something you would probably be kind of interested in.