

Name of Presenter: Marta Pambukhchyan

Occupation: Student

Where Presenter “Works”: CVHS

Topic of Presentation: Scientific Research  
Class/Landfill Investigation Project



# Scientific Research

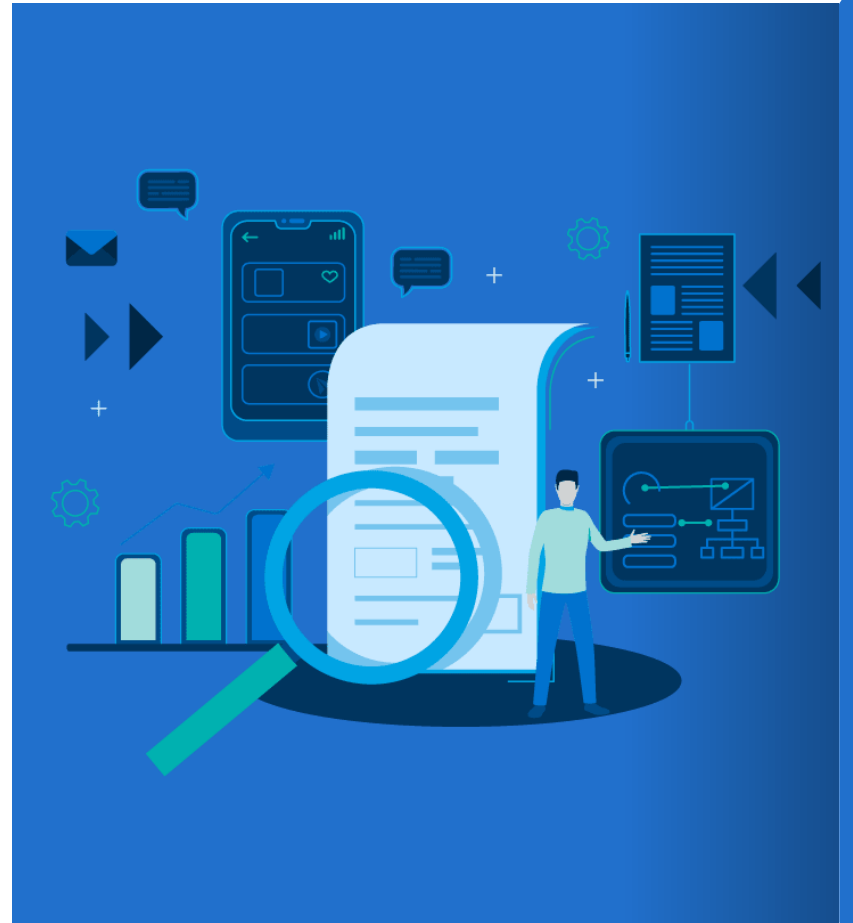
Made/Presented by: Marta Pambukhchyan



# Hello!

**I am Marta Pambukhchyan**

- ❖ Sophomore at CV
- ❖ Part of the Academy
- ❖ Attend the Scientific Research class
- ❖ Been doing a year-long research project



# About Scientific Research



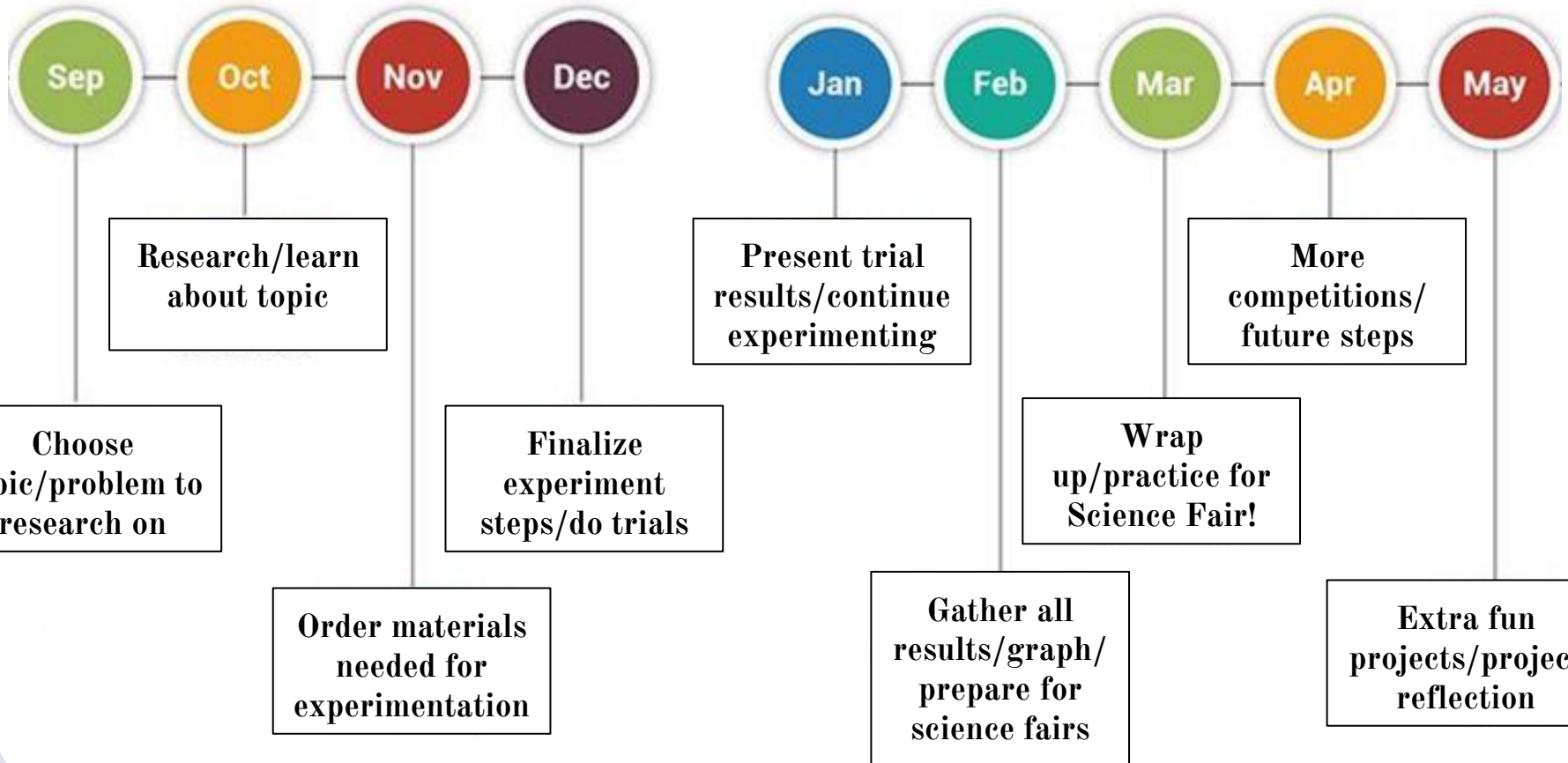
- ❖ ONLY for Academy Students
- ❖ Come up with a specific research topic
- ❖ Learn about that problem/topic
- ❖ Set up an experiment/way to test your problem
- ❖ Collect accurate data
- ❖ Teachers/coaches for help & feedback



# Weekly Work



- ❖ Meet every Wednesday at lunch
- ❖ Work AT LEAST 5 hours a week
- ❖ LOTS of web-searching/learning
- ❖ Weekly updates: what you learned/new data results
- ❖ 5-10 minute presentation with slides

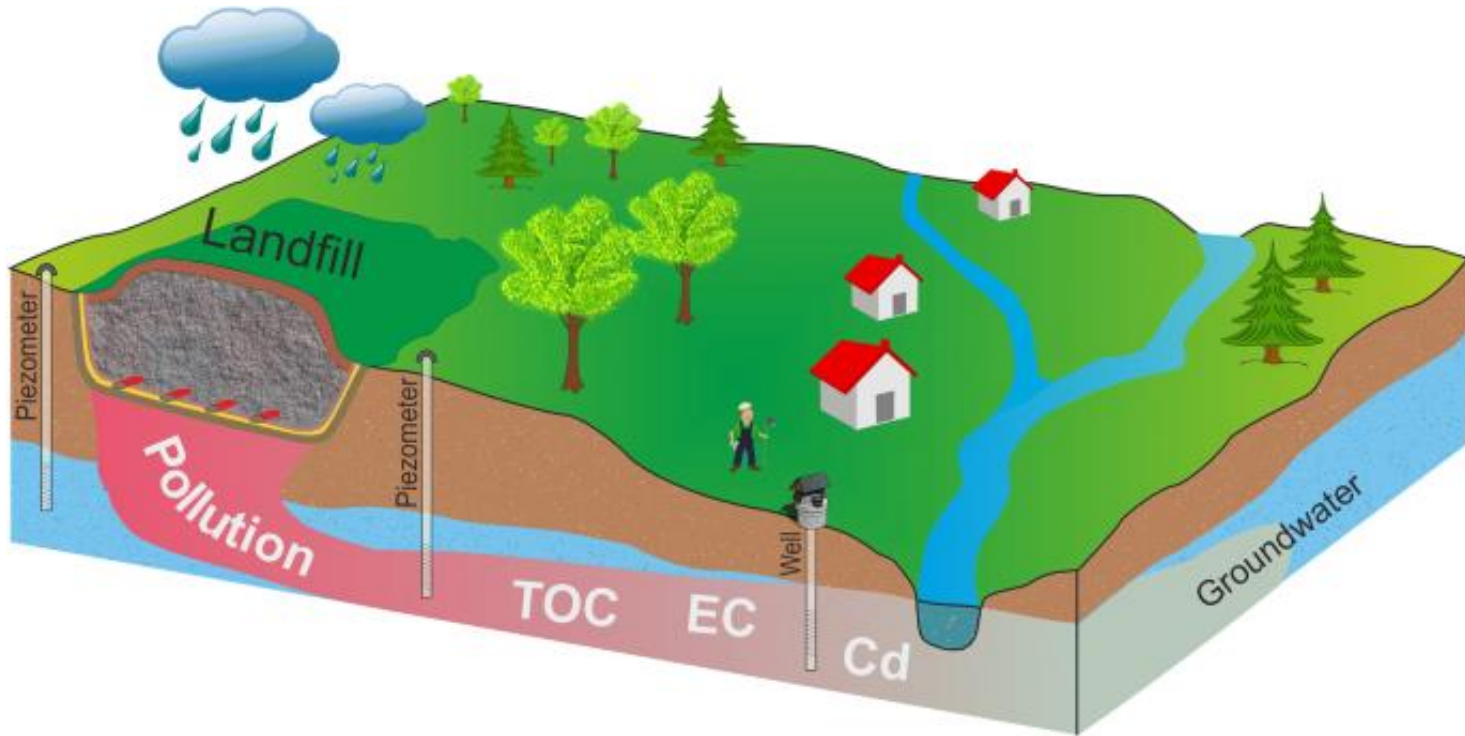


My Research Project:

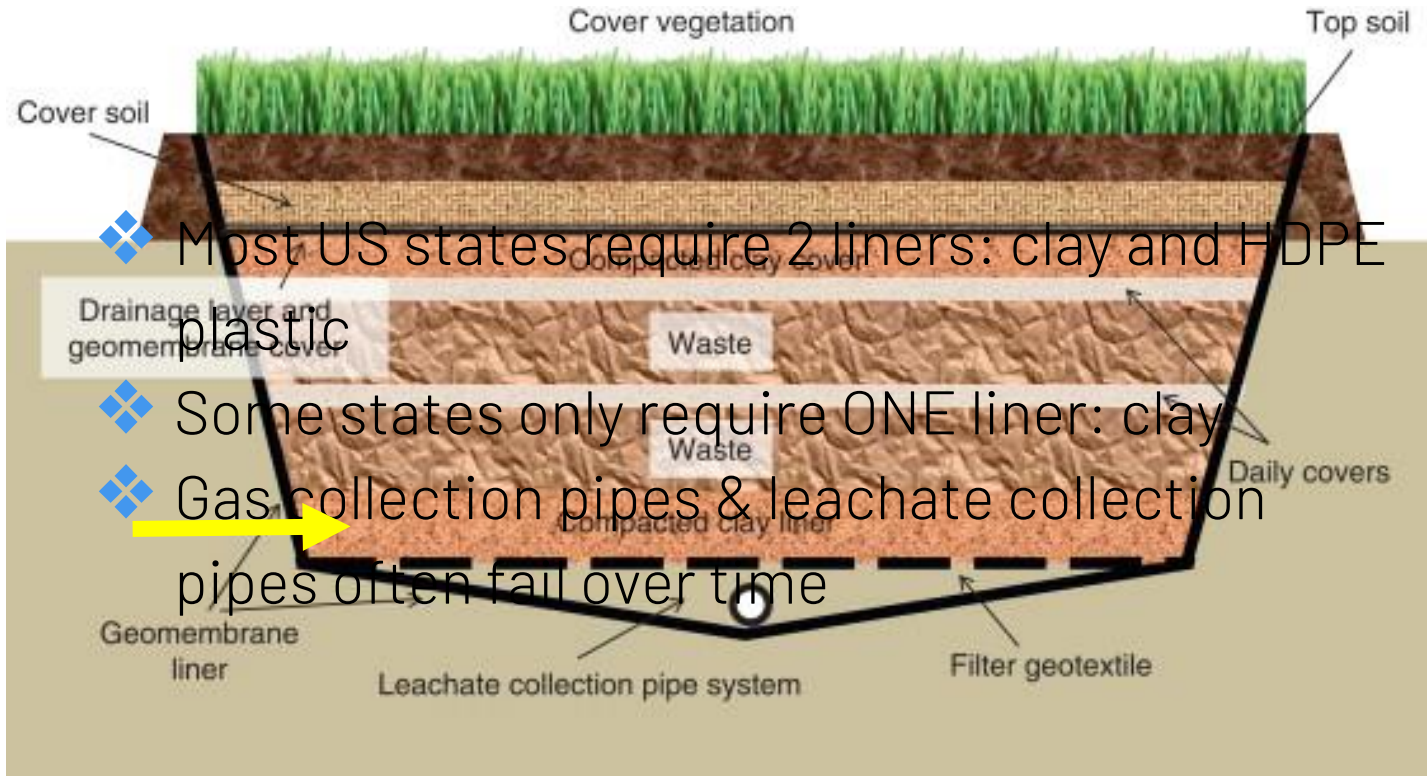
Leachate-Filtering  
Efficacy of Varied Liners



# Problem:







- ❖ Most US states require 2 liners: clay and HDPE plastic
- ❖ Some states only require ONE liner: clay
- ❖ Gas collection pipes & leachate collection pipes often fail over time



**INSIDE:** Sodium Bentonite Clay

**OUTSIDE:** Geotextile fabrics (permeable)





- ❖ **Leachate**: the acidic substance created when rain picks up contaminants from landfill waste
- ❖ **Geosynthetic Clay Liner**: a landfill layer made consisting of Sodium Bentonite clay powder in between two geotextile (permeable) fabrics
- ❖ **Permeable**: allowing liquids and gases to pass through
- ❖ **Impermeable**: not allowing liquids & gases to pass through

# Why Geotextiles? Why Clay?



- ❖ Geotextiles=permeable to allow leachate to reach the powder inside
- ❖ Bentonite powder is basic/alkaline
- ❖ FILTER / NEUTRALIZE the acidic leachate
- ❖ Release CLEAN / NEUTRAL water down to the soil + groundwater
- ❖ Experimentation idea!!



# Research Question:



- ❖ How does the type of powder used in geosynthetic liners affect the pH of the leachate that runs through it?





**Diatomaceous Earth**

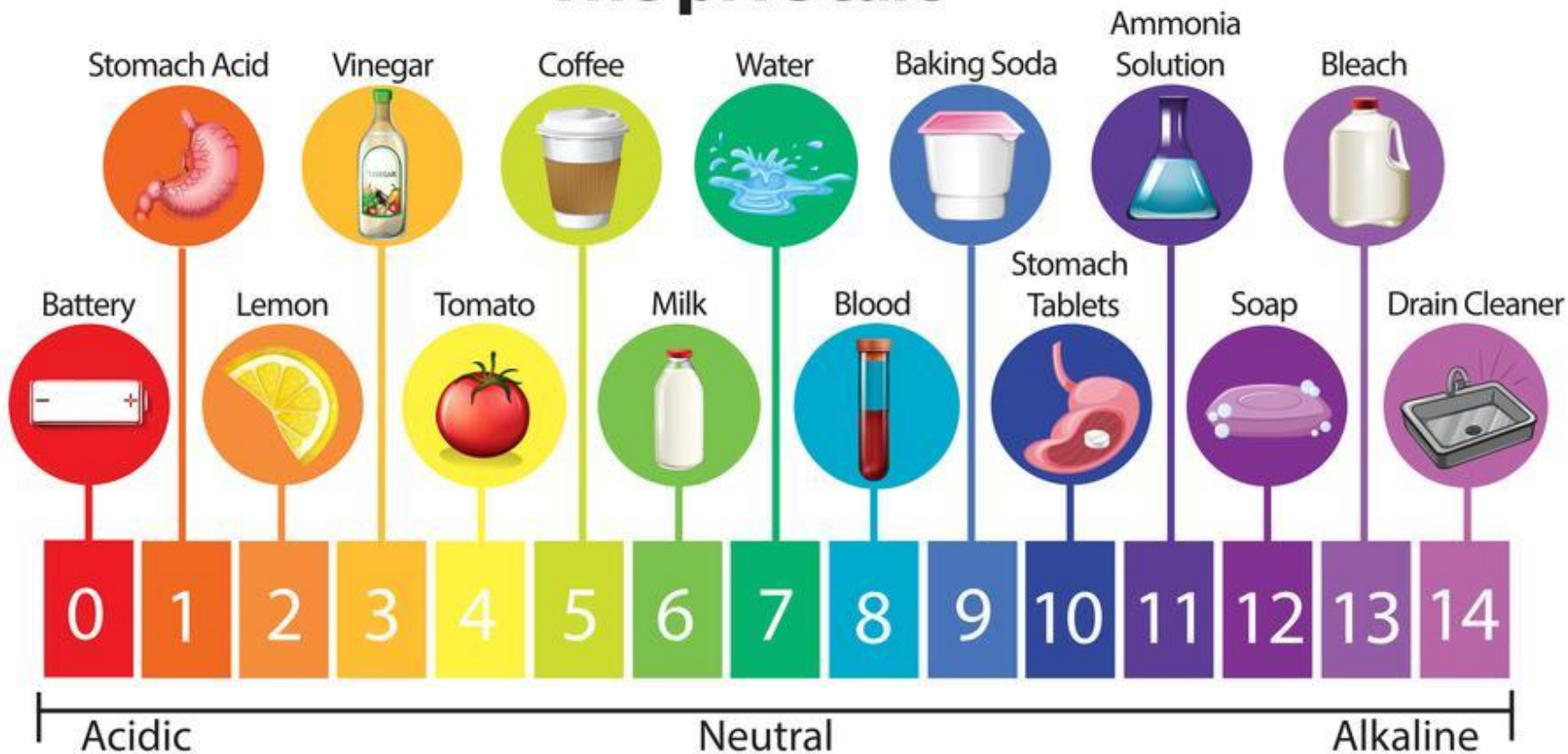


**Activated Charcoal**



4 different basic powders that were tested

# The pH Scale



# Hypothesis:



- ❖ If the basic powders, Kaolin, Diatomaceous Earth, and Activated Charcoal, are used to filter acidic homemade leachates, then the most basic powder will be more efficient than the currently used Bentonite, shown through the closer-to-neutral pH.





# Prediction:

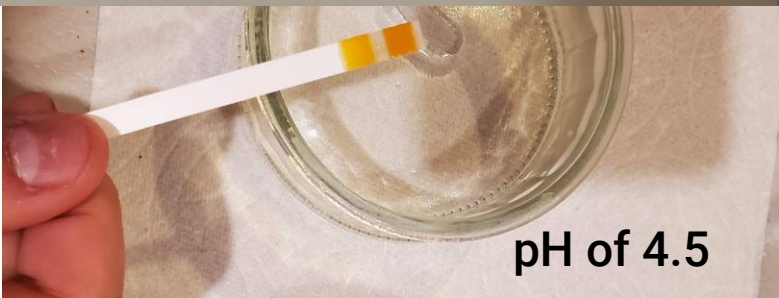
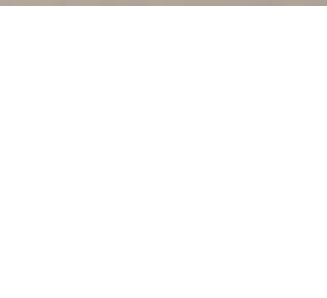
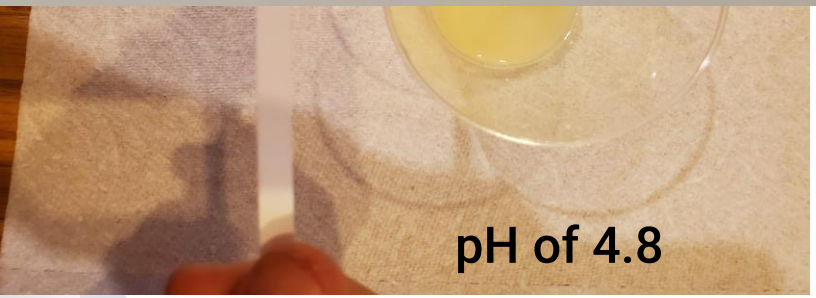
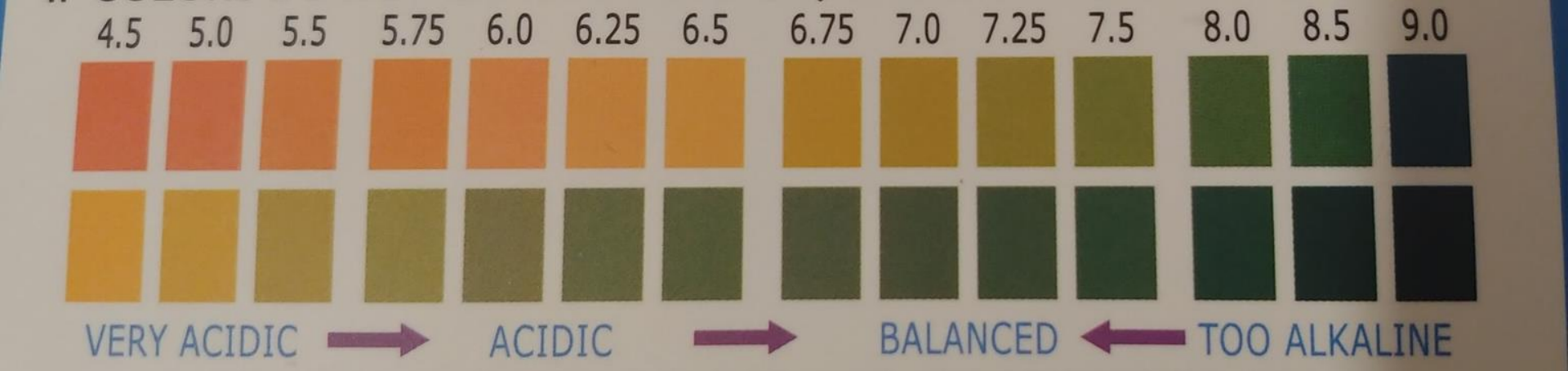
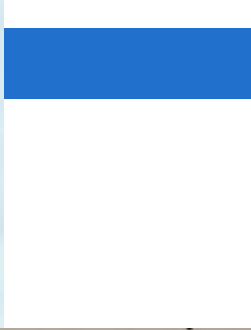


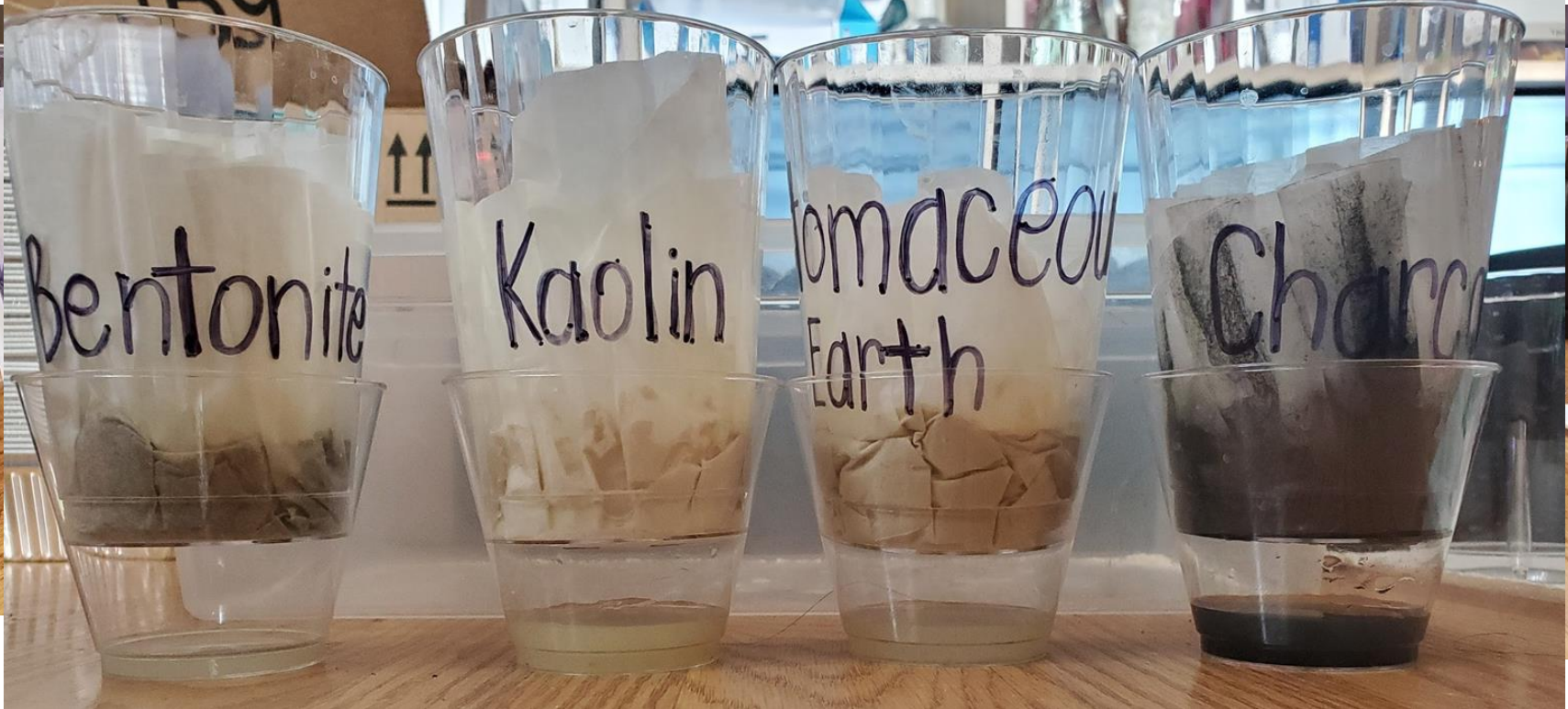
- ❖ Since Diatomaceous Earth has the highest pH of all the other powders (pH of around 9), it is predicted that DE will perform better than Bentonite and the rest of the powders in increasing the pH of the leachate

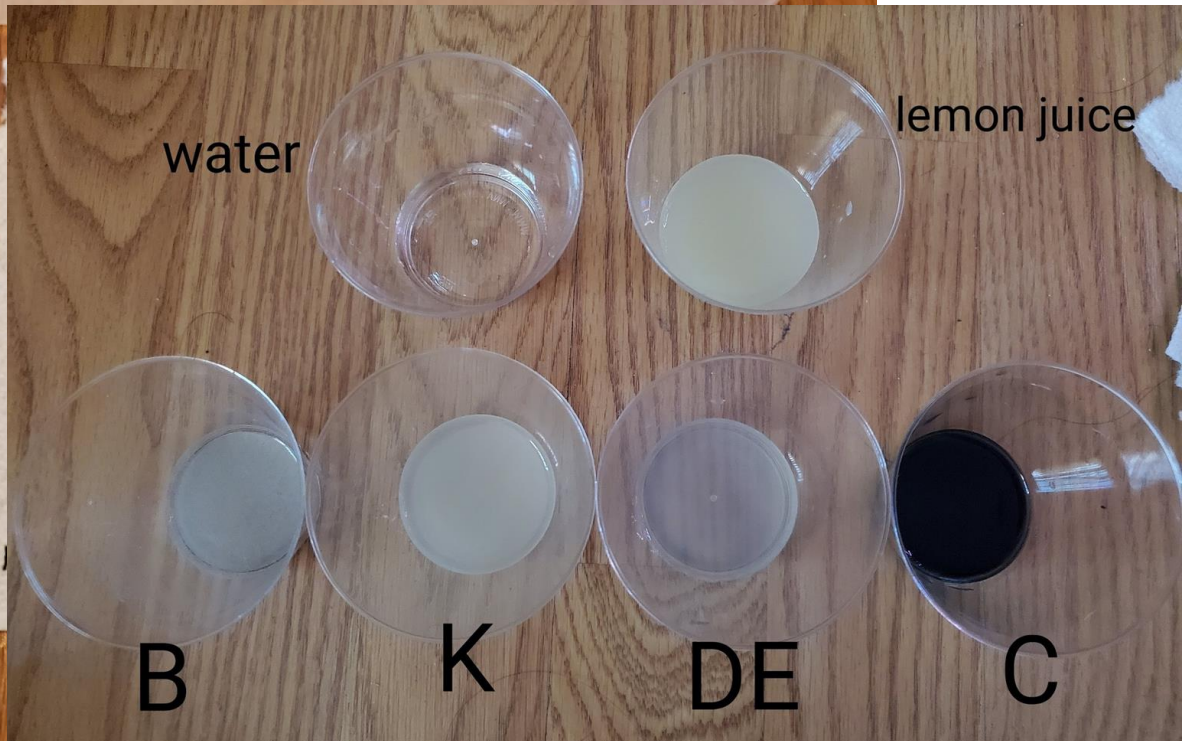
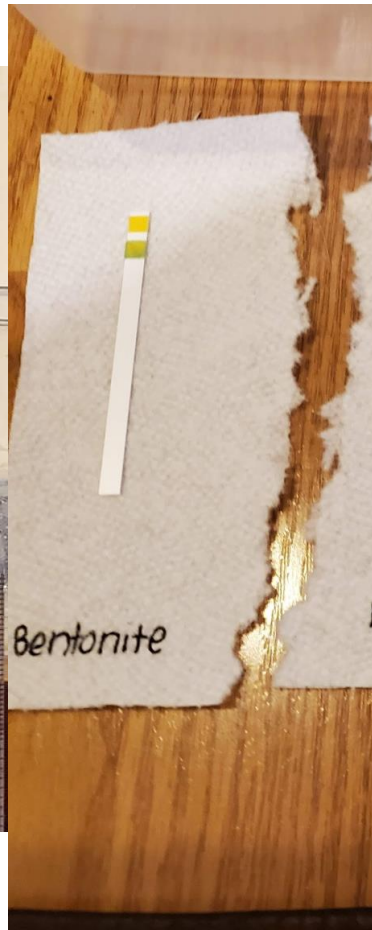
# Experiment:



- ❖ Lemon juice and vinegar as leachates
- ❖ Coffee filter papers as the geotextile fabrics
- ❖ 20 trials in all (10 lemon + 10 vinegar)
- ❖ **Cleaned cups**/trials: clean out cups after each pouring of leachate
- ❖ **Uncleaned cups**: don't clean out cups after each trial







# Test-Run

**Purpose:** see if enough results will appear when experimented this way

**Methodology:** same as on page 1-3 but using 3 teaspoons of leachate (instead of 4)

- paper cups (not plastic)
- only 3 powders (no charcoal)
- 2 cm large holes (instead of 4 smaller ones)
- lemon juice as leachate

**Results:** leachate: lemon juice: pH = 4.8

	Bentonite	Kaolin	Dia. Earth	Charcoal
time (min.)	36'12"	8'27"	23'18"	
cm of liquid				
pH	5.5 (+0.7)	4.8 (same)	5.8 (+1.0)	

## Conclusions:

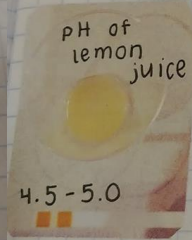
- Bentonite took longest to filter the leachate
- it also filtered the leachate by 0.7 through the pH scale (closer to neutral)
- Kaolin took the shortest filtration time as the leachate passed through quickly
- didn't filter at all as the pH remained in the 4.5-5 range, like the original lemon leachate
- Diatomaceous Earth worked best at filtering the lemon juice

has a full unit pH change: from 4.8 to a 5.8-6

## Changes for Future Trials:

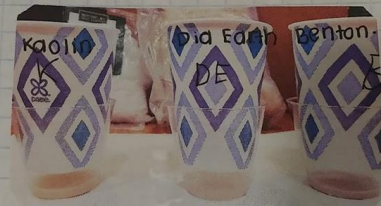
- use clear plastic cups, not paper, in order to view the layers \*add holes with heated tool
- use/add in another possible powder: activated charcoal
- measure the amount of liquid that went through the clay/reached the bottom cup
- mention clay thickness
- increase leachate amount to obtain more results
- take account of qualitative features such as:
  - color of new leachate in comparison to lemon juice
- indicate color of leachate for comparisons

## Pictures:

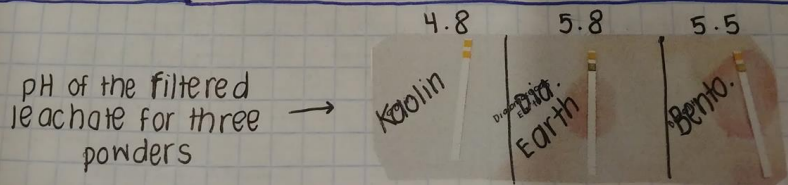


pH of lemon juice

4.5-5.0



experimenter setup



pH of the filtered leachate for three powders

20 trials

10 lemon

10 vinegar

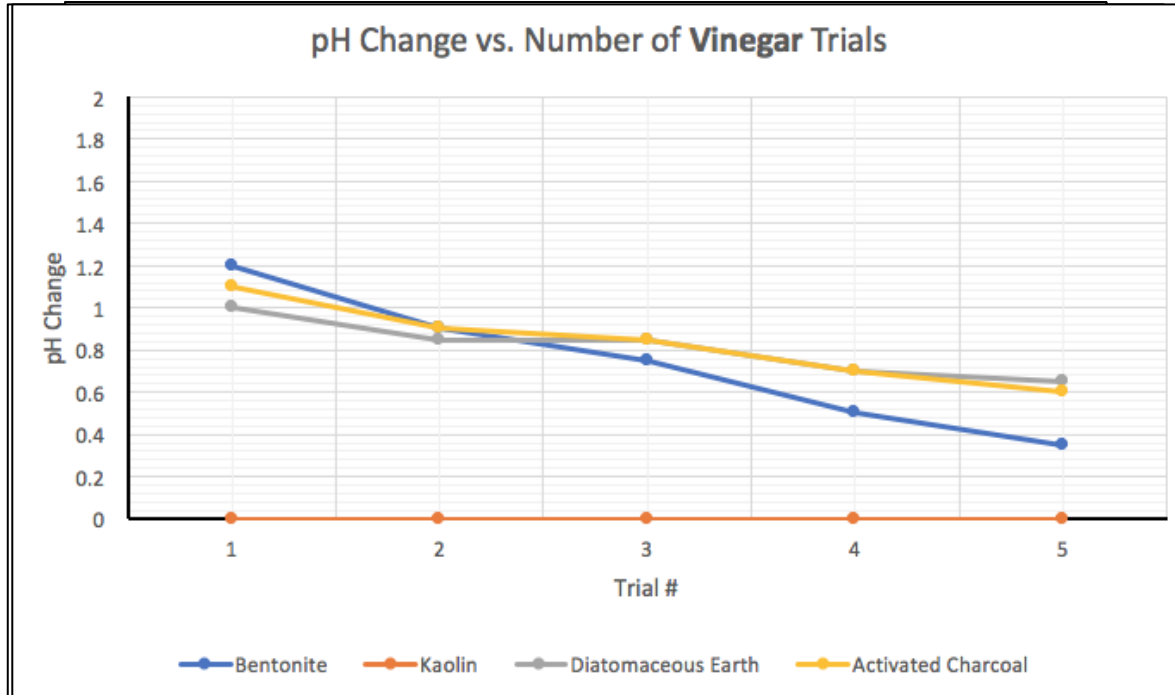
5 cleaned trials

5 uncleaned trials

5 uncleaned trials

5 cleaned trials

# Data Results:





# Statistical Data: T-Test



- ❖ Not statistically correct to compare averages of trials
- ❖ Statistical test is needed
- ❖ t-test/find the p-value (probability value)
  
- ❖ Decided whether the pH results of powders are significant to control (Bentonite)
- ❖ On Excel



# NULL HYPOTHESIS EXAMPLES

THE NULL HYPOTHESIS ASSUMES THERE IS NO RELATIONSHIP BETWEEN TWO VARIABLES AND THAT CONTROLLING ONE VARIABLE HAS NO EFFECT ON THE OTHER.

❖ **Null:** There will be no difference in pH increase between the tested powder and Bentonite

The image consists of three vertical panels, each with a thought bubble containing a null hypothesis. The first panel (orange background) shows a grey cat sitting between two bowls of brown kibble, with a thought bubble stating 'CATS SHOW NO PREFERENCE FOR FOOD BASED ON SHAPE.' The second panel (green background) shows two potted plants under lamps of different colors (yellow and pink), with a thought bubble stating 'PLANT GROWTH IS NOT AFFECTED BY LIGHT COLOR.' The third panel (pink background) shows an older woman and a younger woman playing violins, with a thought bubble stating 'AGE HAS NO EFFECT ON MUSICAL ABILITY.'

❖ p-value is less than  $\alpha$  (alpha)=0.05,

t-Test: Paired Two Sample for Means			t-Test: Paired Two Sample for Means		
	Variable 1	Variable 2		Variable 1	Variable 2
Mean	6.25	6.57	Mean	6.25	6.54
Variance	0.0425	0.012	Variance	0.0425	0.023
Observations	5	5	Observations	5	5
Pearson Correlation	-0.166052791		Pearson Correlation	-0.899568311	
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	4		df	4	
t Stat	-2.873684832		t Stat	-1.858439875	
P(T<=t) one-tail	0.022650072		P(T<=t) one-tail	0.068323529	
t Critical one-tail	2.131846786		t Critical one-tail	2.131846786	
P(T<=t) two-tail	0.045300144		P(T<=t) two-tail	0.136647058	
t Critical two-tail	2.776445105		t Critical two-tail	2.776445105	

**Diatomaceous Earth**  
 significant

**Activated Charcoal**

powerful results ARE NOT statistically

# Conclusion:

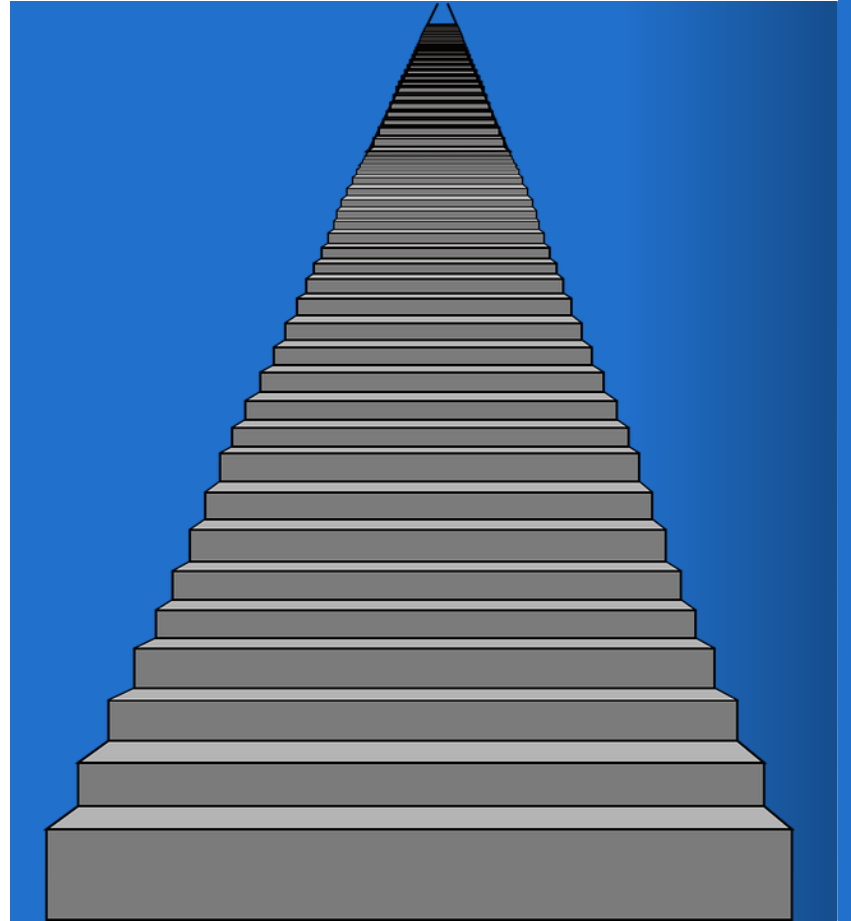


- ❖ DE= only powder that performed better than Bentonite
- ❖ Better filtering alternative
- ❖ Sets a background for future research



# Future Steps:

- ❖ Testing other types of DE
  - food grade
  - pest grade
  - pool grade
- ❖ Add other powders
- ❖ Test total dissolved solids (TDS)



# Competitions:



**1st, 2nd, 3rd place at LACSEF**

**Chosen 1st place**

# Benefits of Research:



- ❖ Working independently
- ❖ Speaking skills
- ❖ Communicating ideas clearly
- ❖ Collaborating with others
- ❖ Overall satisfaction



- ❖ Collecting accurate data
- ❖ Grant proposals & abstracts
- ❖ Writing scientifically
- ❖ Answering questions on the spot
- ❖ competitions

# How to Join?

- ❖ 2021-2022 school year
- ❖ MUST be part of the Academy
- ❖ If not, don't worry 😊, applications will come soon
- ❖ If yes, ask counselor beginning of year
- ❖ Explain that it's a 8th period
- ❖ More info to come!





# Who to Contact?

**Myself (Marta):**

[l.com](#)

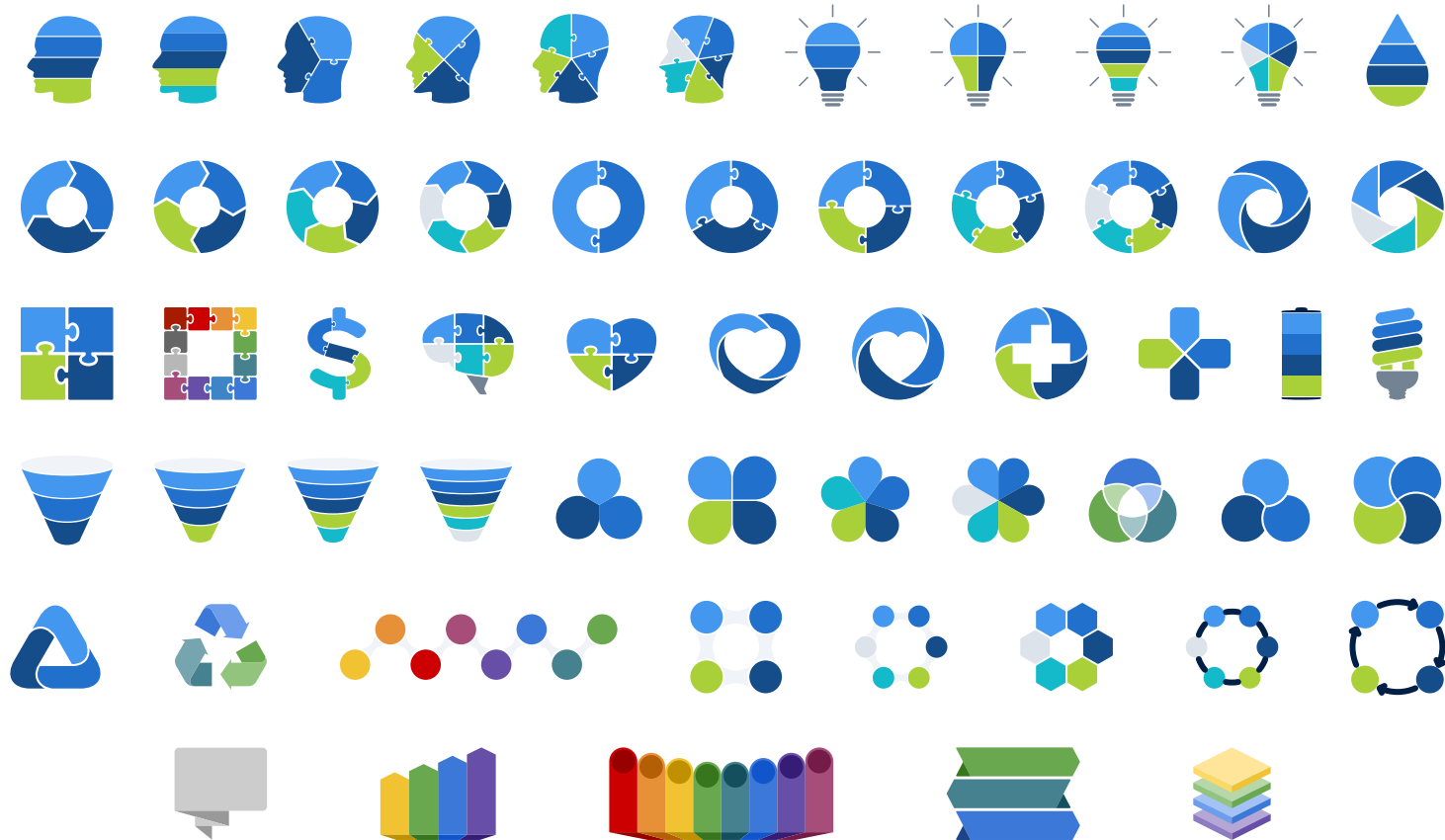
**Jaya Hamkins** (Academy co-pres):

**Ms. Tuason:**

Thank  
you



# Diagrams and infographics





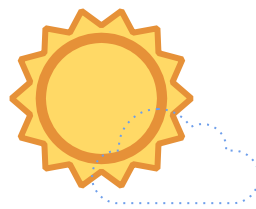
SlidesCarnival icons are editable shapes.

This means that you can:

- ▶ Resize them without losing quality.
- ▶ Change fill color and opacity.
- ▶ Change line color, width and style.

Isn't that nice? :)

Examples:



Find more icons at [slidescarnival.com/extra-free-resources-icons-and-maps](https://slidescarnival.com/extra-free-resources-icons-and-maps)

# Medical Icons



WEBSITE

<https://reliefweb.int/report/world/humanitarian-and-country-icons-2018>

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