Ecocolumn Journey
Kyle Villano
03/28/2017-4/20/17
Living Environment 9

Background Information: In order for our ecocolumn to succeed, each chamber has to connect. Each cycle relies on each other to complete the ecocolumn. Each cycle relies on each other to obtain energy, carbon dioxide, and other important things. If a cycle happens to be missing, the entire ecocolumn will cease to work properly. Which could kill any living organism we have. Each of the cycles have decomposers. If certain bacteria were to disappear from the soil, the cycle would fail. If the cycle fails, the living organism could die. This is important to us because the organisms that don't obtain certain bacterias, we may consume and get sick or infected.
The Carbon, Nitrogen, and Phosphorus cycles are different but are actually really similar. They all have the same purpose. The purpose is to provide for plants, and animals, or any living organisms. The Carbon cycle helps build cells, provides CO_2 for plants/ animals, and helps plants/ animals respire. Carbon is released through dead organisms, by living organisms, and combustion. And eventually released into the atmosphere. The Nitrogen cycle provides N, or Nitrogen for plants/ animals, and also helps plants grow. The nitrogen enters the ground and is then broken up into useable parts for plants. Once plants (producers) have the nitrogen, it is passed on to the first level consumers when they eat the plants. The nitrogen is then passed on to the 2nd level consumer when they eat the 1st level consumer. The nitrogen enters the ground when these animals/plants die or poop. The Phosphorus cycle provide P, or Phosphate for plants/ and living animals. The phosphate coming from the rocks are released by weathering, but the rocks are usually dissolved.

Driving Question: Will our plants grow to their full capability if we consistently do things that will benefit them (ex: water)?

Hypothesis: If we provide the supplements (ex. Water to grow, oxygen to breath) needed for our plants to continue life, they will flourish and grow.

Materials:
- 3 2-liter soda bottles
- Tape (42.1cm in length)
- Soil/ dirt (2473.15g)
- Aquatic Gravel (521.505g)
- Fertilizers (14)
- Radish seeds (12)
- Styrofoam hydroponics holder (cut in half)
- Cotton balls (2)

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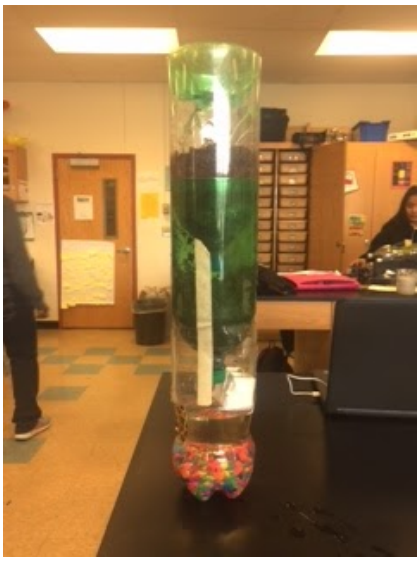
- Cotton sheet (14.0cm in length)

- Water (800 mL total)
- Box cutter
- Exacto knife
- Wood block
- Hammer
- Nails/screwdriver

Procedure:

1. Cut bottle #1 5.5cm from the bottom
2. Poked 12 holes into bottle #1's cap
3. Made another 5.5cm cut from the bottom to bottle #2
4. We cut 15.0cm from the bottom of bottle #3 (we realized there wouldn't be enough room)
5. Taped bottle #2's cap to avoid any dirt/soil from seeping out (3 pcs.)
6. Weighed our amount of dirt in bottle #1 which totaled 1222.25g
7. Added 1829.8g worth of soil/ dirt to bottle #2
8. Added a decomposer, or a worm to bottle #2
9. Added 522.8g worth of aquatic rocks to bottle #3
10. Added 400 mL to bottle #3
11. Added 2 rows of hydroponics to bottle #3
12. Cut the hydroponics in half in order to make space
13. Added 10 fertilizers to bottle #1
14. Added 6 radish seeds to botte #1
15. 100 mL of water to bottle #1
16. Evaluated our ecocolumn and realized we need to make more space in the aquatic chamber
17. Grabbed a new bottle and cut 23cm from bottle #1
18. Flushed out the dirt in bottle #1
19. Added 4 fertilizers to bottle #1
20. Added 6 radish seeds to bottle #1
21. Deducted 578.9g from bottle #2, the decomposer chamber
22. Added 100 mL of water to bottle #1
23. Deducted 1.295g of aquatic rocks from bottle #3
24. Added another 400 mL of water to bottle #3



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25. Deducted 200 mL of water from bottle #3
26. Added .5 mL of start zyme to bottle #3
27. Poked 2 holes in bottle #3's cap
28. Added 100 mL of water to the aquatic chamber or bottle #3
29. Used tape to secure bottle #2 and bottle #3 together
30. Removed old tape from bottle 3
31. Added 5 more holes to our makeshift cap
32. Cut 3 holes for oxygen in bottle #3
33. Cut 4 pieces of tape each 20 cm long by 2cm wide
34. Used (3) 4.8cm piece of duct tape to secure water from spilling out the hole of bottle #3
35. Measured how much ammonia is in our aquatic chamber using a test strip
36. Measured how much nitrate/nitrite is in our aquatic chamber using a test strip
37. Tested bottle #3's water for ammonia levels (yellow)

Kyle Villano and Ameesah Cotten	Day 1 (3/29/17)	Day 2 (3/30/17)	Day 3 (3/31/17)	Day 4 (4/3/17)
Plant Size: (Surface up)				
Height (cm.)	N/A	max.=1.5cm, min.=.1cm	max.=2.5cm., min.=.5cm	max= 6.5cm, min=1cm
Width (cm.)	N/A	.1-.4 cm.	max.=1 cm, min=.1	min. 1cm, max.= 2cm
Observations	Growing, not at surface.	6 are now growing	8 plants are growing	9 plants are growing
Algae Levels	N/A	N/A	N/A	N/A
Visual	N/A	N/A	N/A	N/A
Measured	N/A	N/A	N/A	N/A
Amt. of water used to water plants (ml.)	100ml.	100ml.	100ml.	100ml.
Water color (visual)	Clearish	Clearish	Yellowish	Yellowish

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Water Test (Nitrate/Nitrite) Test Strip	Nitrate:2, Nitrite:0	Not Tested	Nitrate: 10, Nitrite.15	Nitrate: 20 Nitrite: .15
Fish	Not Added	Not Added	Not Added	Not Added
Ammonia	0.1	Not Tested	0.2	0.2
Water added to aquatic chamber (ml.)	0ml.	0ml.	0ml	0.00ML.
Aquatic Plant Size: (Hydroponics, Surface up)				
Height (cm.)	N/A	N/A	N/A	.5cm
Width (cm.)	N/A	N/A	N/A	.5cm
Observations	N/A	Seed opened	Seed Opened	All are growing, one at surface (surface is top of styrofoam)

Day 5 (4/4/17)	Day 6 (4/5/17)	Day 7 (4/6/17)	Day 8 (4/7/17)	Day 9 (4/17/17)
		NO TESTING		
Min.= 0cm, Max=4.5cm	min=0.9cm, max=6.0cm		min.=0.0, cm., max= 7.5 cm	min.=0.0 cm., max.=7 cm.
min.=.5cm, max= 4.5cm	min=0.9cm, max=1.0cm		min.=0.0, cm., max= 4 cm	min.=0.0 cm., max.=4 cm.
Plants are tilting	Plants are growing downward		Plants are falling over	Most plants have fallen over
N/A	N/A		N/A	N/A
N/A	N/A		N/A	N/A

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N/A	N/A		N/A	N/A
100 ml	100 ml		150 ml	125 ml.
*water leaking out (not stopping, this goes for all days).				
Yellowish	Yellowish		Yellowish	Yellow
Nitrate: 20, Nitrite 0.3	Nitrate:50, Nitrite=0.3		Nitrate:50, Nitrite:1	Nitrate:20, Nitrite:1
Not Added	Not Added		Not Added	Not Added
0.2	0.2		1	0.2
0.0 ml	0.0 ml		0.0 ml	0.0 ml.
min.=0, max.=2.5cm	min=2.2cm, max=2.3cm		max=4.5 cm, min=1.5 cm	min.=4 cm, max= 7cm.
min.=0.5cm, max.=3cm	min=0.9cm, max=1.0cm		max=1.5 cm, min=1.1 cm	min=0.3 cm, max.=8.5 cm
Half of one of the plants is tilted below styrofoam	Plants are growing, but have begun to tilt and are now growing downward		continuing to grow	Roots are running out of room
				*Clovers growing in
				decomposing chamber*

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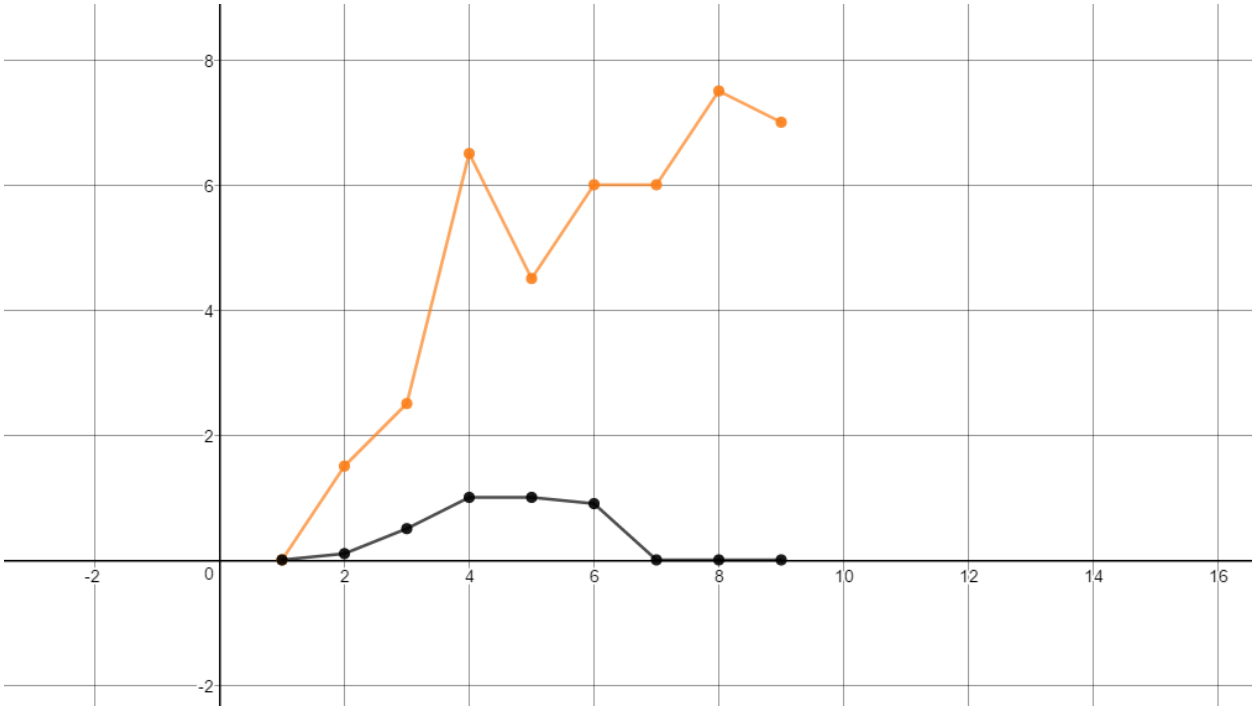


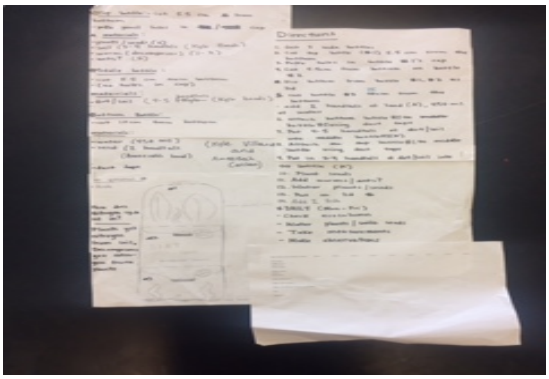
Table of Contents:

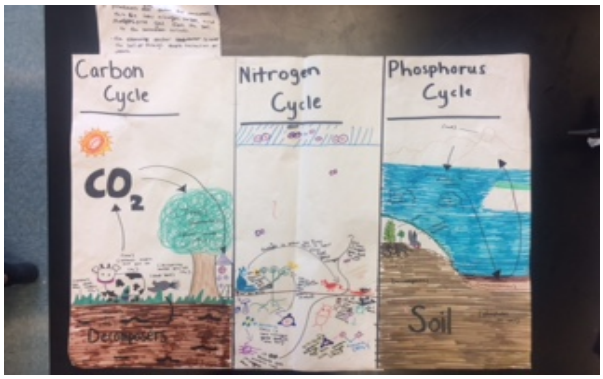
X-axis- Time (days)
Y-axis- Plant Growth (centimeters)
Orange graph- Maximum Plant Growth
Black Graph- Minimum Plant Growth

Analysis: When we begun our ecocolumn journey, there were many trial and errors, we kind of didn't expect the plants to grow at all. Why? Because we didn't know how the ecocolumns would eventually connect, to make plants grow. After about one week, after doing more research, we noticed a little plant growing, but we're a little disappointed because we realized we pushed the seed down too far. We were surprised to see that on day 2, the plants were growing. The plants were growing at a pretty consistent rate. But as the days went by, we started to notice the plants growing downward. We also noticed that the roots of our plants were running out of growing space especially in the aquatic chamber.

There were some structural errors as well. In the aquatic chamber, we had to use a second bottle because there was not enough room. When we redid the chamber and put air holes in it, water started leaking from the hole because the hole was too close to

the water. Also, there was too much dirt in the decomposing chamber. Finally, there was not enough oxygen in the terrestrial chamber and the plants were dying. So we removed the top and the plants flourished again.





Conclusion: Our hypothesis was correct. Our plants flourished once we gave the plats what they needed. For oxygen, we cut holes in the aquatic chamber and the hydroponics flourished. In the terrestrial, we removed the cover. This allowed the plants to have full access to oxygen and they were able to grow higher. For water, we cut holes in the caps of the bottles so when we watered the terrestrial chamber, the water ran down to the decomposing chamber and finally to the aquatic chamber.

While our ecocolumn was successful in keeping out plants alive and growing, there were still some structural errors. One error occured when we cut one of the holes in the aquatic chamber. We cut the hole too low and water slowly leaked out. Despite out attempts to stop the leak with tape, water still leaked out. We also had to redo our aquatic chamber because we cut the bottle too low. This did not leave enough room for the hydroponics and the fisk. Another error was that we used a coke bottle for our second aquatic chamber. This caused the whole structure to be weak because of the way the coke bottles are designed. To counteract this problem, we put tape to hold the decomposing chamber to the rest of the structure to make it stronger. For next time, we suggest using Pepsi bottles only and making our aquatic chamber larger.

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Resources Used:

- Environmental Science; A Study Of Interrelationships (Textbook)
- There's Something Fishy- The Nitrogen Cycle
- https://www.youtube.com/watch?v=oy8e2HrOh6Q

I learned: From this project, I learned about the nitrogen cycle. The nitrogen cycle separates nitrogen so plants can use it. The nitrogen is separated by bacteria or lightning so the plants can absorb it. Producers then get the nitrogen be eating the plant. Consumers get the nitrogen be eating producers or other consumers. When an animal dies, the nitrogen is turned back to its former from and it enters the oxygen once again. This process is key to the survival of all plants and animals. I also learned about ecosystems and what terrestrial and aquatic ecosystems are. An ecosystem is where a group of living things live together. Terrestrial ecosystems are where animals that are on land live and aquatic ecosystems are where animal that live in body of water live. These two ecosystems need each other to survive. Finally, I learned that hydroponics is a good way to grow plants. Before this project, I did not believe that a plant could grow well without soil. Now I know that a plant can grow extremely well with soil as long as it is one properly and it still gets all the nutrients that it needs to survive like nitrogen, phosphorus, and potassium.

Redo: If I had the opportunity to redo this project, there were would be a few things that I would do differently. First, I would use only Pepsi bottles. Coke bottles are designed in a way that they can not hold up weight well. Next, I would make the aquatic chamber larger. The aquatic chamber that was used was not the original one. The original chamber was way too small. The second one was larger but still too small. The aquatic chamber had to be able to hold rocks for weight, the top end of the decomposing chamber bottle, hydroponics, and enough water. Finally, I would try to put a fish in the ecocolumn. TO do this I have to figure out why the water levels were too high to keep a fish alive and well.

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