Passion Project Report

Final Draft

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Passion Project Report

Introduction

The process of my passion project is quite complicated. At first I wanted to do experiments about DNA fingerprinting. This will relate to a method called gel electrophoresis. Gel electrophoresis is a kind of original ways of separating DNA particles according to their sizes. It can be use as a method for primary DNA fingerprinting. However since the dye that color the DNA strands is radioactive and the school can't properly dispose radioactive materials, I have to change my proposal. I plan to collect water samples from different spots of the Kuncheng lake. The second part of the experiment is to add bhumi produced by the recycle Zhixing into water and verify if they really have the function of purifying water.

Method (Step one)

Apparatus (Step one)

1. Water collector: The image on the right is the water collector. Since we are collecting water from the bridge, we need a tool like this to get large quantity of water quickly. There's a lid at the bottom that allows water in while the thermometer inside the

collector shows the temperature of the water.

2. Sparkle software which allows me to collect data and information from the tubes and equipment from the Pasco company.

3. The advanced water quality measuring kit from the PASCO company, including dissolved oxygen kit, pH kit, temperature tube, conductivity probe.

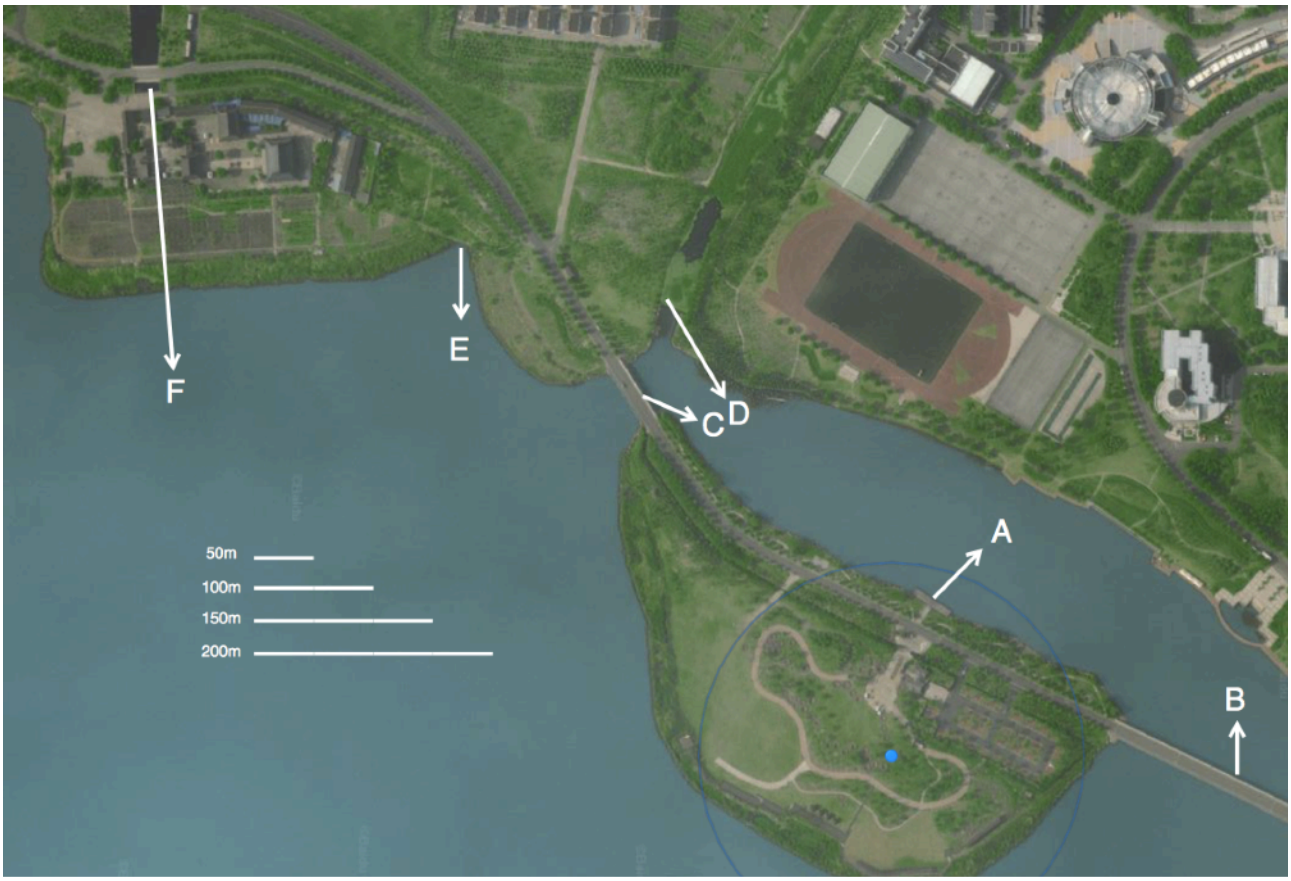
4. The turbidity sensor from the PASCO company. Turbidity actually describes how clear a water sample is.

5. The nitrate kit from the PASCO company. The image on the right shows us what the nitrate kits include.

Method (Step one)

1. I choose six different spot around the campus and collect water. The map below shows us where the six spot is and the measuring scale. So I will explain the six different spots. Spot A is the wooden harbor in front of the school gate, which is still there as we pass by everyday. Spot B is on the bridge of the right of the school. Spot C is on the bridge on the left of the bridge. Spot D is the little fance

that gathers a lot of plant. I stand on the river bank and get water in to the collector. Spot E is a tiny dam neat the temple and spot F is a large well near the temple and it's connected to the lake. These are very important information



because the water quality we find out later is greatly related to the geographic information I mentioned above.We can see a photo of the six water samples I have collected below.

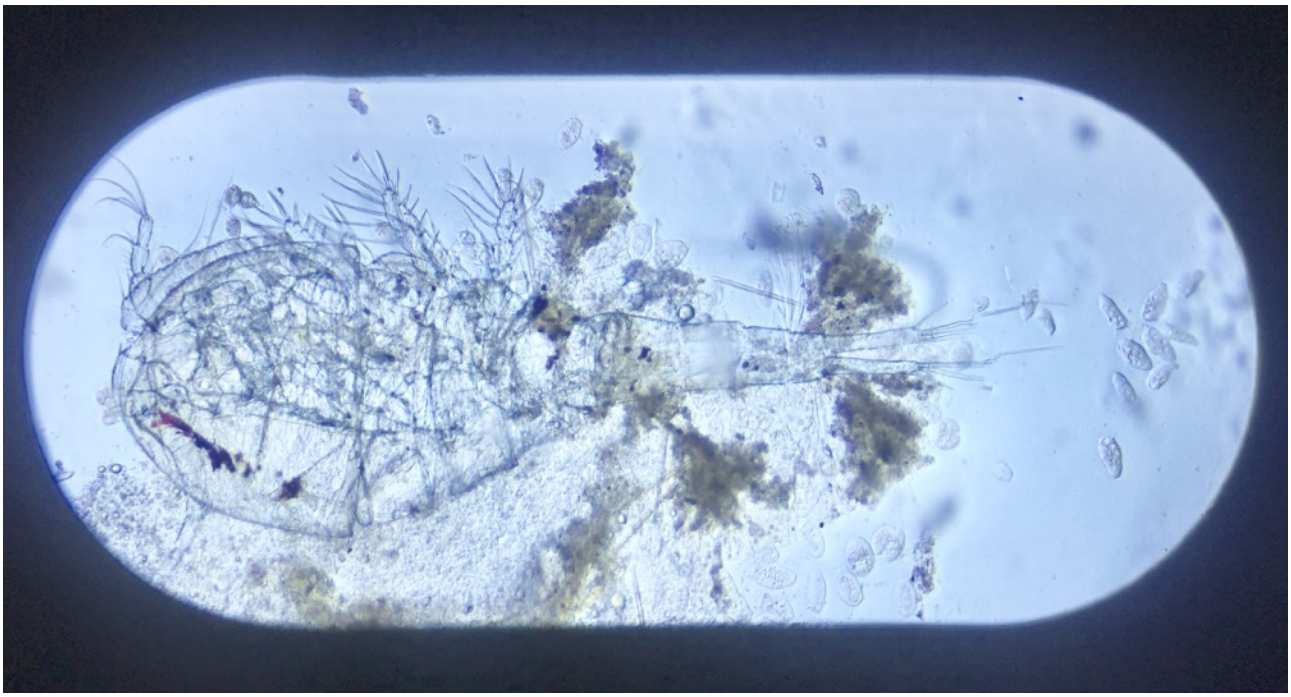
2. I shake the sample sufficiently and pour a small amount to the beaker to test it's quality.

3. I use the probes to test the DO, pH, turbidity and conductivity.

4. Then I use the nitrate kit to measure the nitrate level in each water sample.

5. I use microscope in the lab to observe indicator species in the water samples.

6. After five days, I go to the lab and measure DO again. By subtracting the new DO from the old one, we get the Biochemical Oxygen Demand, BOD for short.



This is a photo of a indicator species: nymph, took under a microscope through iPhone's PANO mode.

Analysis (Step one)

Raw data (Step one)

Original Water Quality Data

	Nitrates(mg/L)	pH	Turbidity(NTU)	DO(mg/L)	Conductivity(uS/cm)	BOD(mg/L)
Pure Water	0	6.10	0	7.94	471	0
A	0.6	6.48	14.4	8.15	541	0.77
B	0.6	6.84	14.6	8.18	525	0.79
C	0.9	6.95	31.7	8.19	518	0.78
D	0.2	6.87	4.1	3.22	552	1.94
E	0.4	6.94	10.9	6.22	541	0.81
F	0.5	7.14	16.9	8.38	532	0.42

Analysis (Step one)

I have marked the abnormal data red. I have also measure the quality of pure water (water from the tap) in order to visualize all the data. I can say that the water quality near the campus is really optimistic. The water is quite healthy and there's not so much nitrate either.

A very interesting thing is that spot D has many abnormal data. Spot D actually have a really high biochemical oxygen demand. This actually is not a good sign. However, as I have mentioned in the first step of the method (step one), the place I collect the water of spot D is the river bank near a fence where gathers a lot of plant. Of course, where the plant gathers, there's a lot of zooplanktons and little aquatic animals wandering around that spot. Because I put the water sample in a sealed bottle and measure the DO level the next day, the little aquatic animals in it may consume a lot of oxygen during the night while photosynthesis rests. Since spot D is the only spot that lacks a bridge or a altitude loss that I can collect water from the main flow, the BOD of spot D is seems quite abnormal, but actually it shows that the health of that spot isn't bad.

After careful considerations, I pick spot B, spot C and spot D for the step two of this experiment. D and C are quite abnormal while B is quite normal, representing the other normal water spots.

Method (Step two)

Apparatus (Step two)

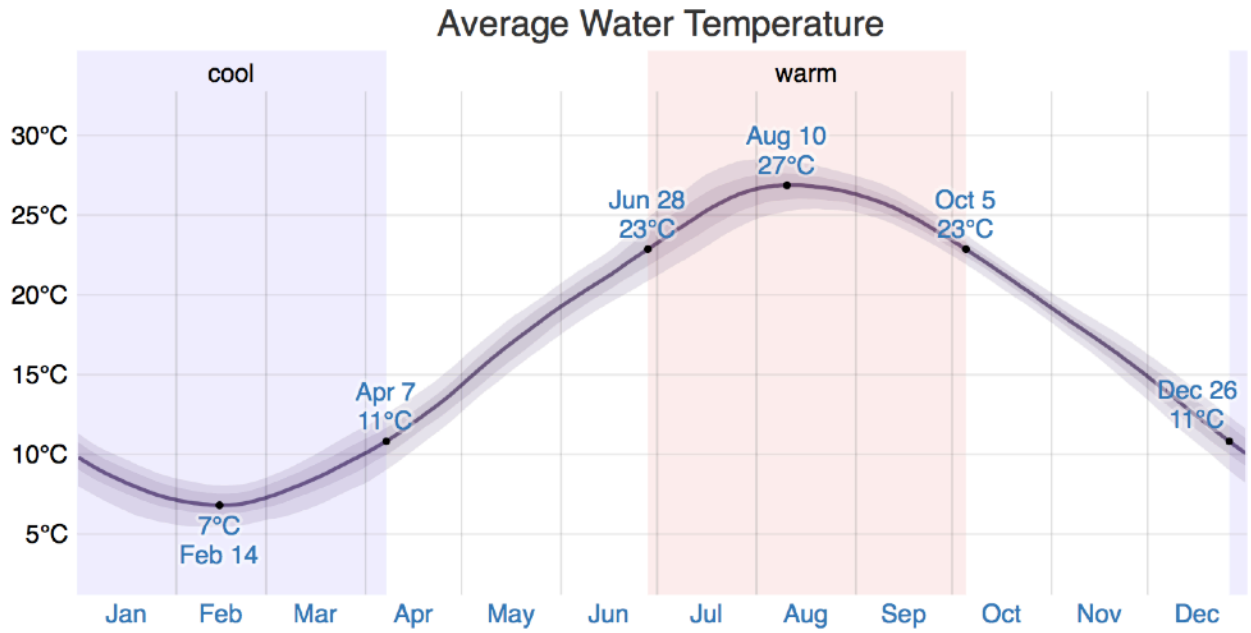
1. Bhuni liquid. This is the liquid produced by the Recycle Zhixing. As you can see from the picture on the right, there's two kind of bhumi, dark one and clear one. How they make this kind of bhumi is that they collect orange and pear peals and seal them in a bottle and let them go through fermentation. The difference between the two type of bhumi is that they add black sugar to the dark one during the fermentation. The bhumi I use during the experiment is fully fermented and without additional carbon dioxide production.

2. Incubators: I use the incubator in 2218. This is the picture of incubators full of sample cups.

3. Plastic cups: Since there are so much trials in this experiment, I can't find any normal equipment for experiment to hold the water sample, like beakers or conical flaks. So I can only use plastic cups. However, this will not be unsustainable since I can wash and clean the cups after this experiment is over and Biology and ESS students can reuse them in class.

Method (Step two)

1. I decide the independent variables. The independent variables are bhumi type, bhumi concentration, water collection spots. I choose 24°C for the temperature of the incubator because the average temperature in summer is 24°C and higher temperature usually leads to higher reactivity.



The daily average water temperature (purple line), with 25th to 75th and 10th to 90th percentile bands.

2. I prepare the cups and mark. This is actually a massive work. I name the independent variables. D for dark bhumi, C for clear bhumi, B, C and D with a circle on it means the water collection spots while 1, 2 and 3 stands for 4%, 8% and 12% of bhumi concentration. 1, 2, and 3 with a circle is the number of trials. Cups with the same code name except the 1, 2, and 3 with circles actually hold the same substance. I also create control

groups. P stands for pure water while N means no bhumi added. The photo on the right show us cups with their code names marked.

3. I full the water and bhumi in according to the markings on the cups. This part really takes a lot of time and requires continuous attention and cautiousness.

4. Then I put the plastic cups into the incubators and keep the incubator working.

5. I wait for three weeks and take the water samples out.

6. I measure the DO and pH. I cannot actually measure all the aspects as I did for the original water samples. For conductivity, since there's no change in ions or metal, there is no need to measure it again. For nitrate level, since each sample needs a vacuum tube, the lab don't have so much tubes. Because nitrate is basic, we can basically see the change of nitrate through pH level.

Analysis (Step two)

Raw data (Step two)

Below we can see the table of the data of DO and pH collected.

	DO (mg/L)			pH		
24 degrees celsius	**1**	**2**	**3**	**1**	**2**	**3**
D1 B	6.06	6.62	6.68	7.97	8.12	8.06
D2 B	5.80	5.60	5.45	7.60	7.80	7.80
D3 B	5.55	5.48	6.60	8.15	8.02	8.32
C1 B	6.81	6.98	7.05	8.35	8.23	8.35
C2 B	6.92	6.85	6.95	8.40	8.35	8.36
C3 B	6.94	6.80	6.80	8.37	8.37	8.35
N B	7.03	7.13	7.14	8.37	8.34	8.35
D1 C	6.63	6.40	6.45	8.04	7.97	7.92
D2 C	6.30	6.35	6.36	7.87	8.20	8.21
D3 C	2.65	2.85	3.88	7.69	7.66	7.52
C1 C	6.96	7.01	6.95	7.90	8.25	8.03
C2 C	6.59	6.87	6.91	8.22	8.19	8.15
C3 C	6.81	6.57	6.79	8.23	8.06	7.99
N C	7.01	7.07	7.08	8.13	8.10	8.16
D1 D	6.82	6.57	6.83	8.24	8.28	8.35
D2 D	5.24	5.32	5.84	7.45	7.88	6.13
D3 D	5.35	5.60	6.02	7.46	7.81	7.14
C1 D	6.78	6.89	6.85	7.21	7.05	7.07
C2 D	6.92	6.96	6.92	7.06	7.05	6.90
C3 D	6.91	6.88	6.87	6.98	7.10	6.95
N D	7.12	7.07	7.04	7.06	7.10	7.05
N P	7.06	7.12	7.11	6.85	7.00	7.00

Analysis (Step two)

From the data in the table, we can see that both the DO and the pH level increase with the increase of concentration.

An increase of DO indicates a greater biodiversity which is great for water samples. However, the increase of pH is not good for water sample. Nitrates are basic, since the change bhumi liquid can bring is really limited, we can say that the increase of pH indicates the production of new nitrate. Nitrate can lead to an increase in aquatic plants, for example, algae. The increase of aquatic plants can gradually use up the oxygen in the water and cause eutrophication.

Conclusions

Conclusions

In the passion project, I measure the water quality of Kunchen lake. I find out that the water quality near the school is quite good. Then I add in Bhumi liquid to see if it really helps purify the water. I find out that it helps increasing DO level. However, more nitrate is generated so bhumi is more proper to serve as liquid nutrient for plants.

Evaluation and reflections

Because of the time limit created by the passion project and the proposal changes, the time left for me to do this experiment is real little. I can create more independent variables and add more trials since the IB recommends five trials a least for each sample. If I have more time, I can make the pace of the experiment slower and have more accurate results.

I have also learned a lot from this experiment. I have a brief understanding of the water quality around the UWCCSC campus. I help the recycle Zhixing test their results. Meanwhile, I have more concept of how to carry out the EEs next year. This passion project is challenging but great.

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